# Groundwater Monitoring Network System Certification

for Compliance with the Coal Combustion Residuals (CCR) Rule

Former BC Cobb Power Plant

*Muskegon Environmental Redevelopment Group, LLC* 

November 1, 2024





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## Table of Abbreviations and Acronyms

Abbreviation	Definition
AMSL	above mean sea level
BC Cobb	Former BC Cobb Power Plant
BGS	below ground surface
BTV	background threshold values
CCR	Coal Combustion Residuals
CEC	Consumers Energy Company
COI	constituent of interest
EGLE	Michigan Department of Environment, Great Lakes, and Energy
EPA	U.S. Environmental Protection Agency
MERG	Muskegon Environmental Redevelopment Group, LLC
TDS	total dissolved solids
ТОС	top of casing
TSS	total suspended solids

## Certification

#### Groundwater Monitoring System for Compliance with the Coal Combustion Residuals Rule

### Muskegon Environmental Redevelopment Group

#### Former B.C. Cobb Power Plant, Muskegon, Michigan

I hereby certify that the groundwater monitoring system at the Former B.C. Cobb Power Plant is designed to meet the performance standard in Sections §257.91 of the Federal Coal Combustion Residuals Rule, and that the groundwater monitoring system has been designed and constructed to ensure that the groundwater monitoring will meet this performance standard for the CCR unit located at the Former B.C. Cobb Power Plant.



Lara Zawaideh-Syrocki, PE ENV SP Michigan PE License 6201065363 License Renewal Date 02/03/2026

# 1.0 Introduction

The U.S. Environmental Protection Agency's (EPA) final Coal Combustion Residuals (CCR) Rule establishes a comprehensive set of requirements for the management and disposal of CCR (or coal ash) in landfills and surface impoundments by electric utilities. The Former BC Cobb Power Plant ("BC Cobb" or "Site"), located at 151 North Whitehall Road in Muskegon, Muskegon County, Michigan was owned and operated by Consumers Energy Company (CEC) from 1948 until operation ceased and the plant was demolished in 2016. The property is currently owned by the Muskegon Environmental Redevelopment Group (MERG) (**Figure 1**). BC Cobb has two CCR units subject to the CCR Rule: Ponds 0-8 and the Bottom Ash Pond.

This document supports compliance with the CCR Rule by demonstrating that the groundwater monitoring system at BC Cobb meets the requirements outlined in Section §257.91 of the Rule, which states:

Section §257.91(f): 'The owner or operator must obtain a certification from a qualified professional engineer stating that the groundwater monitoring system has been designed and constructed to meet requirements of this section [§257.91]. If the groundwater monitoring system includes the minimum number of monitoring wells specified in paragraph (c)(1) of this section [Section § 257.91], the certification must document the basis supporting this determination.'

**Table 1** summarizes components required by groundwater monitoring systems, per the CCR Rule and the professional engineer's certification of compliance with these requirements. The remainder of this document provides information to support certification for the multiunit groundwater monitoring system at BC Cobb.

#### Table 1. Summary of 40 CFR Section §257.91 Groundwater Monitoring System Requirements and Site-Specific Compliance

Groundwater Monitoring System Requirements	Compliance with Requirement
(a) <i>Performance standard.</i> The owner or operator of a CCR unit must install a groundwater monitoring system that consists of a sufficient number of wells, installed at appropriate locations and depths, to yield groundwater samples from the uppermost aquifer that:	Yes. A groundwater monitoring system has been established that includes the minimum number of wells at appropriate locations and donthe to viold the unpermost
(1) Accurately represent the quality of background groundwater that has not been affected by leakage from a CCR unit. A determination of background quality may include sampling of wells that are not hydraulically upgradient of the CCR management area where:	groundwater samples surrounding each CCR facility. See Sections 3.0 and 4.0. The
<ul> <li>(i) Hydrogeologic conditions do not allow the owner or operator of the CCR unit to determine what wells are hydraulically upgradient; or (ii) Sampling at other wells will provide an indication of background groundwater quality that is as representative or more representative than that provided by the upgradient wells; and</li> <li>(2) Accurately represent the quality of groundwater passing the waste</li> </ul>	background wells for the facility are: MW-15002, MW-15003, MW-15004, MW-15005, MW-15006, MW-15007, and MW-15008. The downgradient wells for the facility are: MW-15009, MW-15010, MW-15013, MW-
boundary of the CCR unit. The downgradient monitoring system must be installed at the waste boundary that ensures detection of groundwater contamination in the uppermost aquifer. All potential contaminant pathways must be monitored.	15014R, MW-15015R, MW-15016R, MW-15017, MW-15018, MW-15019, MW-15020, MW-15021, MW-15022, MW-15023, MW-17001R, MW- 17002, MW-17003, MW-17004, MW- 17005, and MW-17006.
<ul> <li>(b) The number, spacing, and depths of monitoring systems shall be determined based upon site-specific technical information that must include thorough characterization of:         <ul> <li>(1) Aquifer thickness, groundwater flow rate, groundwater flow direction</li> </ul> </li> </ul>	<b>Yes.</b> The monitoring system was designed based on results of technical, site-specific data, including (b)(1) and (b)(2).
<ul> <li>including seasonal and temporal fluctuations in groundwater flow; and</li> <li>(2) Saturated and unsaturated geologic units and fill materials overlying the uppermost aquifer, materials comprising the uppermost aquifer, and materials comprising the confining unit defining the lower boundary of the uppermost aquifer, including, but not limited to, thicknesses, stratigraphy, lithology, hydraulic conductivities, porosities, and effective porosities.</li> </ul>	See Sections 3.0 and 4.0, which describes the hydrogeologic parameters of the Site. In addition, cross sections in Appendix A display the lithologies, stratigraphy, and overlying and underlying geologic units.
(c) The groundwater monitoring system must include the minimum number of monitoring wells necessary to meet the performance standards specified in paragraph (a) of this section, based on the site-specific information specified in paragraph (b) of this section. The groundwater monitoring system must contain:	<b>Yes.</b> Monitoring wells that meet the performance standards are located at the CCR units.
<ul> <li>(1) A minimum of one upgradient and three downgradient monitoring wells; and</li> <li>(2) Additional monitoring wells as necessary to accurately represent the quality of background groundwater that has not been affected by leakage from the CCR unit and the quality of groundwater passing the waste boundary of the CCR unit.</li> </ul>	The background wells for the facility are: MW-15002, MW-15003, MW- 15004, MW-15005, MW-15006, MW- 15007, and MW-15008. The downgradient wells for the facility are: MW-15009, MW-15010, MW-15013, MW-15014R, MW-15015R, MW- 15016R, MW-15017, MW-15018, MW-15019, MW-15020, MW-15021, MW-15022, MW-15023, MW- 17001R, MW-17002, MW-17003, MW-17004, MW-17005, and MW- 17006. See Section 4.0.

#### Table 1. Summary of 40 CFR Section §257.91 Groundwater Monitoring System Requirements and Site-Specific Compliance

Groundwater Monitoring System Requirements	Compliance with Requirement
(d) The owner or operator of multiple CCR units may install a multiunit groundwater monitoring system instead of separate groundwater monitoring systems for each CCR unit.	Yes. A multiunit system capable of detecting monitored constituents per (d)(1) was installed for the two CCR
(1) The multiunit groundwater monitoring system must be equally as capable of detecting monitored constituents at the waste boundary of the CCR unit as the individual groundwater monitoring system specified in paragraphs (a) through (c) of this section for each CCR unit based on the following factors: (i) Number, spacing, and orientation of each CCR unit; (ii) Hydrogeologic setting; (iii) Site history; and (iv) Engineering design of the CCR unit. (2) If the owner or operator elects to install a multiunit groundwater monitoring system, and if the multiunit system includes at least one existing unlined CCR surface impoundment as determined by §257.71(a), and if at any time after October 19, 2015 the owner or operator determines in any sampling event that the concentrations of one or more constituents listed in appendix IV to this part are detected at statistically significant levels above the groundwater protection standard established under §257.95(h) for the multiunit system, then all unlined CCR surface impoundments comprising the multiunit groundwater monitoring system are subject to the closure requirements under §257.101(a) to	See Sections 2.0 and 4.0. There are unlined active CCR units included in the multiunit system, requirements per (d)(2) do apply.
retrofit or close. (e) Monitoring wells must be cased in a manner that maintains the integrity of the monitoring well borehole. This casing must be screened or perforated and packed with gravel or sand, where necessary, to enable collection of groundwater samples. The annular space ( <i>i.e.</i> , the space between the borehole and well casing) above the sampling depth must be sealed to prevent contamination of samples and the groundwater.	Yes. Well design meets requirements (e). Well logs are provided in Appendix B. See Section 4.0. The design, installation, and development of monitoring wells is
(1) The owner or operator of the CCR unit must document and include in the operating record the design, installation, development, and decommissioning of any monitoring wells, piezometers and other measurement, sampling, and analytical devices. The qualified professional engineer must be given access to this documentation when completing the groundwater monitoring system certification required under paragraph (f) of this section. (2) The monitoring wells, piezometers, and other measurement, sampling	Monitoring Well Design, Installation, and Development (Arcadis, 2016). Groundwater monitoring devices, including pumps and field instruments, are operated and maintained according to manufacturer's recommendations
and analytical devices must be operated and maintained so that they perform to the design specifications throughout the life of the monitoring program.	and the monitoring system will be maintained per (e)(2).
(f) The owner or operator must obtain a certification from a qualified professional engineer stating that the groundwater monitoring system has been designed and constructed to meet the requirements of this section. If the groundwater monitoring system includes the minimum number of monitoring wells specified in paragraph (c)(1) of this section, the certification must document the basis supporting this determination	<b>Yes.</b> System designed and constructed to meet the requirements of Section §257.91. Technical information to support certification and number of wells, per (c)(1).
supporting this determination.	See Sections 2.0, 3.0 and 4.0.
	The PE certification of this GMS Certification satisfies paragraph (f).



Figure 1. Vicinity Map for the Former BC Cobb Power Plant



Figure 2. BC Cobb – CCR Units and Monitoring Well Location Map

# 2.0 Facility Description

The Former BC Cobb is the site of a former coal power generation facility located at 151 North Whitehall Road in Muskegon, Muskegon County, Michigan. The facility was owned and operated by CEC from 1948 until operation ceased and the plant was demolished in 2016. The property is currently owned by the MERG (**Figure 1**).

BC Cobb was retired from operations on April 15, 2016. Ponds 0-8 were used to treat CCR contact wash water and miscellaneous low volume wastewaters during decommissioning. MERG initiated clean closure of the ponds in 2020 by installing a slurry wall around the perimeter berm adjacent to the North Branch of the Muskegon River. Dewatering began in July 2020 to prepare for excavation and removal of waste CCR and disposal offsite. Ash removal began in August 2020. Excavation, and ash removal was completed in April of 2022, and dewatering ceased on June 15, 2022 (HDR, 2022).

# 2.1 CCR Bottom Ash Pond

From 1948 through plant closure in 2016, CCR was deposited in the ponds by utilizing sluicing methods. Bottom ash slurry was directed into the Bottom Ash Pond, with Bottom Ash Pond overflow being directed into Ponds 5 or 6. Overflow from these ponds was subsequently directed to Pond 1 before being routed through Ponds 2, 3, and 4 (CEC, 2016). Each pond allowed a portion of CCR particles to settle out before the overflow was transferred to the next pond. The overflow from Pond 4 was discharged to a National Pollutant Discharge Elimination System (NPDES) outfall located on the Discharge Channel.

# 2.2 CCR Ponds 0-8

During active operations, fly ash from the power plant was directed into Ponds 7 and 8. Overflow from Ponds 7 and 8 was then directed to Pond 1 before being routed through Ponds 2, 3, and 4 and discharged through the NPDES outfall location (CEC, 2016). CCR was periodically removed from the ponds and disposed or beneficially reused. During operation of the CCR units, the pond surface water elevations were at 588 feet. Since plant closure in 2016, the pond water elevation has lowered and appears to be below that of the adjacent Muskegon River.

CEC performed a document search and was unable to find design and construction records for Ponds 0-8. Permits from 1956 approved an expansion of earthen dikes to support coal ash storage. Ponds 0-4 are identifiable on a 1968 aerial photograph (CEC, 2016). A CEC drill hole location map from 1979 shows Ponds 0-4 and Ponds 6-8 in similar configuration to that shown in Figure 3, which represents the site condition at the time MERG took ownership of the property. This provides an estimate of when Ponds 0-8 were constructed.



Figure 3. BC Cobb – CCR Units and Well Location Map - 2020 Condition

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# 3.0 Site Hydrogeology and Conceptual Model

Ponds 0-8 are primarily comprised of CCR and sand fill. According to historic U.S. Geologic Survey (USGS) topographic maps and aerial photographs dating back to 1929, the area currently occupied by the ash ponds was originally marsh land. The subsurface materials in the pond area generally consist of CCR ranging from 3 to 28 feet below ground surface (ft bgs) overlying 10 to 20 feet of poorly graded, fine-grained sand. Discontinuous layers of organic materials (i.e., humus and peat) are present within the fine-grained sand. Organic-rich silt was also encountered at depths ranging from 20 to 30 ft bgs, beneath the fine-grained sand, ranging in thickness from approximately 1 to 13 feet. The organic-rich silt deposits are thickest in the perimeter berms along the southernmost edge of the pond area (toward Muskegon Lake). Thinner deposits of the organic-rich silt were encountered toward the northernmost edge of the pond area. Silty clay and/or poorly graded, fine- to medium-grained sand is generally observed within 30 to 40 ft bgs, beneath the organic-rich silt. An underlying clay was encountered throughout the pond area at approximately 40 ft bgs, beneath the fine to medium-grained sand. Geologic cross sections are provided in Appendix A.

Geologic maps of Michigan and local well records indicate that 120 to 190 feet of glaciolacustrine sand, gravel, moraine and lacustrine clay deposits are present throughout Muskegon County. These lacustrine deposits are situated on top of the sandstone bedrock that is part of the Marshall Formation, typically encountered at approximately 200 to 250 ft bgs throughout Muskegon County. Glacio-lacustrine sands dominate in the western and southern areas surrounding Muskegon Lake.

Ponds 0-8 are bound by surface water features (**Figure 3**): The North Branch Muskegon River and former plant-associated discharge channel adjoin the western and southernmost boundaries of the pond area, and Veterans Memorial Park is located north and northeast of the pond area. MERG understands that there is surface water pumping at the Veterans Memorial Park on an occasional basis to limit the flooding in some areas of the park. Pumping performed at the park has the potential to have an effect on the groundwater flow conditions at BC Cobb. Therefore, changes over time in groundwater flow conditions at the Site boundary will need to give consideration to that potential for impact.

Groundwater flow within the uppermost aquifer has varied during plant operations and the postshutdown period. While the ponds were actively receiving CCR and non-CCR wastewater, groundwater in the pond area was several feet higher than the surrounding surface water in Muskegon River and upgradient groundwater, creating a mound under the BC Cobb surface impoundments, with groundwater flowing outward toward the surface water features. Since the power plant shut down in April 2016, groundwater is encountered at a similar elevation to the surrounding surface water, generally within the range of 579 to 583 feet above mean sea level (ft AMSL).

During the most recent monitoring event in March 2024, groundwater elevations varied little across the site, ranging between 579.63 and 580.40 AMSL, with a flow direction generally northeast (**Figure 3** and **Figure 4**). The gradient across the site in March 2024 was 0.0009 ft/ft.



Using the average hydraulic conductivity measured at the Ponds 0-8 monitoring wells of 58 feet/day (ARCADIS, 2016), and an assumed effective porosity of 0.3, this results in groundwater flow rate of approximately 0.31 feet/day (approximately 113 feet/year).



Figure 4. Deep Groundwater Potentiometric Surface – March 2024



Figure 5. Shallow Groundwater Potentiometric Surface – March 2024

The CCR Rule requires, at a minimum, one upgradient and three downgradient monitoring wells per CCR unit to be completed in the uppermost aquifer. Section §257.91 of the Rule states that the operator: "...may install a multiunit groundwater monitoring system instead of separate groundwater monitoring systems for each CCR unit." In addition, the CCR Rule states that downgradient monitoring wells should be installed to: "accurately represent the quality of groundwater passing the waste boundary of the CCR unit. The downgradient monitoring system must be installed at the waste boundary that ensures detection of groundwater contamination in the uppermost aquifer."

Based on the CCR requirements, hydrogeological data, and site visits, there are a total of twenty-six (26) wells in the certified monitoring system (**Figure 2**), including:

- Seven background (upgradient wells): MW-15002, MW-15003, MW-15004, MW-15005, MW-15006, MW-15007, and MW-15008
- Nineteen compliance wells:
  - Thirteen deep wells: MW-15009, MW-15010, MW-15013, MW-15014R, MW-15015R, MW-15016R, MW-15017, MW-15018, MW-15019, MW-15020, MW-15021, MW-15022, and MW-15023
  - $\circ~$  Six shallow wells: MW-17001R, MW-17002, MW-17003, MW-17004, MW-17005, and MW-17006
- One water level only well: MW-15001 (not included in the certified network)

The monitoring system at the CCR multiunit meets the requirements of the CCR rule and provides a sufficient number and spacing of wells at depths and screened intervals to accurately represent the quality of groundwater passing the waste boundary of the CCR unit to ensure detection of groundwater contaminants in the uppermost aquifer and monitor all potential contaminant pathways from the CCR units.

**Figure 3** displays the monitoring well locations in the 2020 condition, when the embankments between Ponds 0-8 and the Bottom Ash Pond were visible. Monitoring wells could not be installed in the embankments due to concerns with structural integrity. Based on the CCR requirements, hydrogeological data, site visits, and the embankments separating impoundments, Ponds 0-8 and the Bottom Ash Pond were treated as one CCR multi-unit and 23 monitoring wells (MW-15001 through MW-15023) were originally installed surrounding the unit boundary, with MW-15001 through MW-15008 representing background water quality and MW-15009 through MW-15023 representing downgradient water quality. The groundwater level contour maps provided in **Figure 4** and **Figure 5** confirm that the groundwater flow direction is generally northwest and MW-15002 through MW-15008 are upgradient.

MW-15001 was sampled during the background monitoring phase of the CCR Rule compliance program but now serves as a nature and extent well with only static water level measurement required.

Shallow wells (identified as MW-17001 through MW-17006) were installed in 2017 and were paired with existing wells MW-15016 through MW-15021 to better characterize shallow groundwater quality and flow direction (**Figure 2**). MW-15016R through MW-15021 now provide data on deeper groundwater while MW-17001R through MW-17006 provide shallow groundwater data.

To accommodate pond closure construction in 2020, MW-15012 was abandoned and wells MW-15015, MW-15016, and MW-17001 were relocated to within 10 feet of the original location. In February 2022, monitoring wells MW-15014 and MW-15011 were abandoned to accommodate continued CCR removal efforts. Well MW-15014 was relocated approximately 100 feet south. Relocated wells are distinguished with an "R" following the well identifier (MW-15014R, MW-15015R, MW-15016R and MW-17001R).

## 4.1 Background Monitoring Wells

The upgradient wells for the unit are MW-15002, MW-15003, MW-15004, MW-15005, MW-15006, MW-15007, and MW-15008. Well locations for each upgradient well are in (**Figure 2**). MW-15002, MW-15003, MW-15004, MW-15005, MW-15006, MW-15007, and MW-15008 will capture background water quality in the aquifer before passing under the CCR unit and reaching the downgradient wells.

# 4.2 Downgradient Monitoring Wells

A multiunit monitoring network of 21 wells, listed below, was installed around the boundary of the CCR unit to serve as downgradient wells (**Figure 2**). The downgradient well locations will detect constituents of interest from the CCR units, if present.

•	MW-15009	•	MW-15016R	•	MW-15021	•	MW-17003
•	MW-15010	•	MW-15017	•	MW-15022	•	MW-17004
•	MW-15013	•	MW-15018	•	MW-15023	•	MW-17005
•	MW-15014R	•	MW-15019	•	MW-17001R	•	MW-17006
•	MW-15015R	•	MW-15020	•	MW-17002		

# 4.3 **Perimeter and Characterization Wells**

MW-15001 was sampled during the background monitoring phase of the CCR Rule compliance program but now serves as a nature and extent well with only static water level measurement required.

# 4.4 Well Construction

The CCR monitoring wells were drilled by a licensed well driller using hollow-stem auger or sonic drilling methods. Wells MW-15001 through MW-15023 were installed in 2015 and details are provided in the Summary of Monitoring Well Design, Installation, and Development by Arcadis (Arcadis, 2016). Wells MW-17001 through MW-17006 were installed in 2017 (TRC,

2019). Wells MW-15015R, MW-15016R, and MW-17001R were installed in 2020, replacing MW-15015, MW-15016, and MW-17001, respectively. MW-15014R was installed in 2022, replacing MW-15014.

Boreholes were drilled to depths ranging from 20 to 50 feet below ground surface. Once the target drilling depth was reached at each borehole, the 2-inch diameter, Schedule 40 PVC casing and well screen (0.010-inch slots) were assembled and installed. The length of the monitoring well screens vary from 3 feet to 10 feet. Well construction details for all CCR wells are summarized in **Table 2** and boring logs are provided in Appendix B.

Well ID	Easting NAD83 State Plane, Michigan South 2113 (feet)	Northing NAD83 State Plane, Michigan South 2113 (feet)	Elevation TOC (feet) NAVD88	Depth of Screen Interval (feet bgs)	Well Total Depth (feet bgs)	Well Stickup³ (feet)	Casing Type	Static Depth to Water <sup>2</sup> (feet BTOC)	Static Water Elevation (feet)
MW-15001 Water Level Only	12624262.18	645763.32	586.52	10-20	20	2.92	2-inch Sch. 40 PVC	6.38	580.14
MW-15002	12624512.86	645701.73	586.87	15-20	20	3.07	2-inch Sch. 40 PVC	6.51	580.36
MW-15003	12624726.22	645555.93	587.12	13-18	18	3.02	2-inch Sch. 40 PVC	6.77	580.35
MW-15004	12624824.48	645491.68	590.57	5-15	15	2.87	2-inch Sch. 40 PVC	10.16	580.41
MW-15005	12624783.15	645166.74	587.77	5-15	15	2.97	2-inch Sch. 40 PVC	7.56	580.21
MW-15006	12624610.52	645291.65	587.81	5-15	15	2.91	2-inch Sch. 40 PVC	7.37	580.44
MW-15007	12624188.85	645409.39	587.43	4-10	10	2.93	2-inch Sch. 40 PVC	7.11	580.32
MW-15008	12623510.47	645340.01	587.76	4-9	9	2.96	2-inch Sch. 40 PVC	7.73	580.03
MW-15009	12623622.98	645606.92	589.27	14-24	24	2.97	2-inch Sch. 40 PVC	9.04	580.23
MW-15010	12623979.47	645690.69	588.11	12-22	22	2.91	2-inch Sch. 40 PVC	7.88	580.23
MW-15011 <sup>6</sup>	12623765.87	645780.29	595.22	21-31	31	2.92	2-inch Sch. 40 PVC	22.58	572.64
MW-15012⁵	12623545.99	645889.92	597.39	21-31	31	2.89	2-inch Sch. 40 PVC	15.05	582.34

#### Table 2. Well Construction Details for Groundwater Monitoring at Former BC Cobb

Well ID	Easting NAD83 State Plane, Michigan South 2113 (feet)	Northing NAD83 State Plane, Michigan South 2113 (feet)	Elevation TOC (feet) NAVD88	Depth of Screen Interval (feet bgs)	Well Total Depth (feet bgs)	Well Stickup <sup>3</sup> (feet)	Casing Type	Static Depth to Water <sup>2</sup> (feet BTOC)	Static Water Elevation (feet)
MW-15013	12623389.21	645716.41	598.50	30-40	40	2.60	2-inch Sch. 40 PVC	9.92	580.08
MW-15014 <sup>6</sup>	12623318.73	645925.93	599.04	23-31	31	2.84	2-inch Sch. 40 PVC	16.50	573.02
MW-15014R	12323293.80	645827.80	589.7	27-32	32	2.8	2-inch Sch. 40 PVC	9.39	580.31
MW-15015 <sup>1</sup> Abandoned	12623024.09	646138.93	596.75	20-30	30	2.85	2-inch Sch. 40 PVC	14.19	582.56
MW-15015R	12623028.78	646150.02	586.52	13-23	23	-0.27	2-inch Sch. 40 PVC	6.15	580.37
MW-15016 <sup>1</sup> Abandoned	12622459.26	646227.56	589.05	35-40	45	2.85	2-inch Sch. 40 PVC	6.65	582.40
MW-15016R	12622458.17	646237.39	586.62	40-44	44	-0.20	2-inch Sch. 40 PVC	6.64	579.98
MW-15017	12622085.55	646354.69	588.61 586.33 <sup>4</sup>	35-40	40	2.91 -0.29 <sup>4</sup>	2-inch Sch. 40 PVC	6.49	579.84
MW-15018	12622179.74	646789.54	592.43 586.33 <sup>4</sup>	37.5-42.5	42.5	3.03 -0.26 <sup>4</sup>	2-inch Sch. 40 PVC	6.70	579.63
MW-15019	12622369.93	647103.13	592.42 586.32 <sup>4</sup>	37-42	42	3.02 -0.29 <sup>4</sup>	2-inch Sch. 40 PVC	6.64	579.68
MW-15020	12622626.85	647436.97	592.23 586.26 <sup>4</sup>	35-40	40	2.73 -0.41 <sup>4</sup>	2-inch Sch. 40 PVC	6.54	579.72
MW-15021	12623310.03	646654.84	593.73	39.5-42.5	42.5	3.03	2-inch Sch. 40 PVC	13.70	580.03
MW-15022	12623634.96	646263.16	595.82	24-30	30	3.22	2-inch Sch. 40 PVC	15.41	580.41

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Well ID	Easting NAD83 State Plane, Michigan South 2113 (feet)	Northing NAD83 State Plane, Michigan South 2113 (feet)	Elevation TOC (feet) NAVD88	Depth of Screen Interval (feet bgs)	Well Total Depth (feet bgs)	Well Stickup <sup>3</sup> (feet)	Casing Type	Static Depth to Water <sup>2</sup> (feet BTOC)	Static Water Elevation (feet)
MW-15023	12622999.24	647125.15	588.08	12-19.5	19.5	2.68	2-inch Sch. 40 PVC	7.80	580.28
MW-17001 <sup>1</sup> Abandoned	12622452.1	646228.0	589.29	15-20	20	3.19	2-inch Sch. 40 PVC	6.75	582.54
MW-17001R	12622452.13	646239.58	586.61	15-20	20	-0.22	2-inch Sch. 40 PVC	6.18	580.43
MW-17002	12622087.2	646348.8	588.79 586.26 <sup>4</sup>	13.5-18.5	18.5	2.99 -0.28 <sup>4</sup>	2-inch Sch. 40 PVC	5.82	580.44
MW-17003	12622184.8	646794.9	592.37 586.31⁴	17-22	22	3.07 -0.26 <sup>4</sup>	2-inch Sch. 40 PVC	5.95	580.36
MW-17004	12622373.4	647110.1	591.84 586.27 <sup>4</sup>	17.5-22.5	22.5	2.74 -0.32 <sup>4</sup>	2-inch Sch. 40 PVC	5.92	580.35
MW-17005	12622619.7	647433.9	592.42 586.33 <sup>4</sup>	20-25	25	3.12 -0.24 <sup>4</sup>	2-inch Sch. 40 PVC	6.15	580.18
MW-17006	12623301.6	646657.7	593.78	24.5-29.5	29.5	3.33	2-inch Sch. 40 PVC	13.33	580.28

<sup>1</sup>Wells were removed in May 2020 during the construction of a soil bentonite wall (SBW) and relocated within 10 feet of previous location. Relocated wells denoted with "R" after original well ID number. Easting/Northing location data obtained from MERG survey May 21, 2020.

<sup>2</sup>Static water level for wells were measured March 27, 2024. The static water levels shown for abandoned wells MW-15011 and MW-15014 were measured the week of October 19, 2021. The static water levels shown for abandoned wells MW-15012, MW-15015, MW-15016, and MW-17001 were measured the week of May 7, 2020.

<sup>3</sup>Location and construction data (Easting/Northing, Elevation TOC, Screen Interval, Well Stickup, and Casing Type) for wells MW-15001 – MW-15023 was obtained from *Summary of Monitoring Well Design, Installation, and Development* report by Arcadis 2016. Location and construction data for wells MW-17001 – MW-17006 was obtained from the *2019 Annual Groundwater Monitoring Report* prepared by TRC (TRC, 2020). Construction data was obtained for MW-15015R, MW-15016R, and MW-17001R from Final Boring-Well Logs prepared by SME May 12, 2020. These can be found in Appendix B.

<sup>4</sup>Well elevations changed from stick up to flush mount for construction activities May 12, 2020.

 $^5\!Well$  was abandoned in June 2020 to accommodate construction activities.

<sup>6</sup>Well was abandoned in February 2022, MW-15014 was replaced with MW-15014R to accommodate construction activities.

# 5.0 Groundwater Quality Sampling

# 5.1 Schedule

Sampling is conducted at a frequency compliant with CCR Part §257.94. CEC completed eight rounds of upgradient and downgradient monitoring well sampling for the original well network between November 2015 and September 2017 to represent background water quality and establish background threshold values (BTVs) for each constituent of interest (COI) in **Table 3**. Upon completion of the eight rounds of sampling to establish background groundwater quality, semi-annual (twice per year) groundwater detection monitoring was initiated. Groundwater quality sampling will be conducted in all upgradient, and downgradient monitoring wells and samples will be analyzed for the parameters in Appendix III and IV of Part §257, plus TSS, as described below in compliance with CCR Part 257.94 and 257.95. Groundwater monitoring will continue as appropriate based upon the results of sampling.

## 5.2 Sample Collection

Samples are collected following the protocol in the Groundwater Sampling Collection Standard Operating Procedure (HDR, 2020). Groundwater quality sampling is conducted in all upgradient and downgradient monitoring wells unless wells are dry. In accordance with the CCR Rule and the Standard Operating Procedure, groundwater samples are not field filtered. The field parameters of turbidity, pH, ORP, and temperature are measured using a YSI Professional Plus (or an equivalent) portable water quality instrument that has been calibrated prior to use.

# 5.3 Analytical Testing

Analytical testing of groundwater samples will be performed by an EPA certified laboratory. For the initial eight background sample events, samples were analyzed for the constituents shown on **Table 3**, with the exception of Total Suspended Solids (TSS), which was added when MERG acquired the property. For detection monitoring, the constituents listed in Appendix III will be analyzed. Subsequent sampling events will be analyzed for the constituents listed in Appendix III or IV and TSS as appropriate, based upon the results of previous sampling and statistical evaluation of results. For quality control, two field duplicate samples will be collected for each sample event.

Table 3. Groundwater Quality Constituents
Appendix III Constituents for Detection Monitoring
Boron
Calcium
Chloride
Fluoride
рН
Sulfate
Total Dissolved Solids (TDS)
Appendix IV Constituents for Assessment Monitoring

Table 3. Groundwater Quality Constituents
Antimony
Arsenic
Barium
Beryllium
Cadmium
Chromium
Cobalt
Fluoride
Lead
Lithium
Mercury
Molybdenum
Selenium
Thallium
Radium 226 and 228 combined
Additional Parameters
Total Suspended Solids (TSS)

# 6.0 Reporting

The CCR Part §297.90(e) identifies the reporting requirements for the groundwater monitoring program for the CCR units. The first annual reporting document was completed by January 31, 2018 and annually thereafter. The annual reports are placed in the BC Cobb operating record. Annual reports will summarize key monitoring actions completed, describe any problems encountered, discuss actions to resolve the problems, and project key activities for the upcoming year. For CCR compliance, MERG will file the report in the operating record.

The statistical methods used to analyze each specified constituent in each monitoring well is described in a separate Statistical Methods Certification document (HDR, 2020).

MERG will comply with the CCR Rule recordkeeping requirements specified in §257.105(h), notification requirements specified in §257.106(h), and internet requirements specified in §257.107(h).

# 7.0 References

ARCADIS. May 13, 2016. Summary of Monitoring Well Design, Installation, and Development. BC Cobb Electric Generation Facility – Muskegon, Michigan. Prepared for Consumers Energy Company.

Consumers Energy Company, 2016. History of Construction. October 17, 2016.

HDR, Inc. September 19, 2022. CCR Removal Report. Prepared for Muskegon Environmental Redevelopment Group, LLC.

HDR, Inc. August 14, 2020. Hydrogeologic Monitoring Plan. Prepared for Muskegon Environmental Redevelopment Group, LLC.

HDR, Inc. August 14, 2020. Groundwater Sample Collection Standard Operating Procedure. Prepared for Muskegon Environmental Redevelopment Group, LLC.

TRC Environmental Corporation. January 2019. 2018 Annual Groundwater Monitoring Report, Consumers Energy, Former BC Cobb Power Plant, Bottom Ash Pond & Ponds 0-8, Muskegon, Michigan. Prepared for Consumers Energy Company.

TRC Environmental Corporation. January 2020. 2019 Annual Groundwater Monitoring and Corrective Action Report, Consumers Energy, Former BC Cobb Power Plant, Bottom Ash Pond & Ponds 0-8, Muskegon, Michigan. Prepared for Consumers Energy Company.



# A

**Geological Cross-Sections** 





FSS

PATH: 3/201929-838\_CHARAH\_BC\_COB8\_ASH POND\_ISYROCK072\_WORK\_N\_PROGRESSIMAP\_DOCS/DRAFTCHARAH\_BC\_COB8\_MW\_CROSSIECTIONS.MID = USER: AMAPLE

BC COBB POWER PLANT MUSKEGON COUNTY, MICHIGAN Profile B-B'



FSS



Peat, Organic Clay, Organic Silt

\_\_\_\_ Closure Excavation Grade Screen



# Well Logs



FX

Dat Dat Dril Dril Dril San Rig Wat	e Sta e Fini ling C ler's I ling M npling Type ter Le ter Le	rt: 10/ ish: 10 Compa Name: Methoo g Metho: Soni evel St evel Fi	12/15 0/12/1 any: M : Johr d: Han nod: ( c c c art (ft. nish (f	5 Aateco n Pitsc nd Aug Continu . <b>bgs.)</b> ft. <b>bto</b>	Drillin h ger/Sor uous : 3.8 c.): 5.	g nic .96		Northing: 645763.32 Easting: 12624262.15 Casing Elevation: 586.52 Borehole Depth (ft. bgs.): 20.0 Surface Elevation: 583.6 Descriptions By: A. Westhuis	Well/Boring ID: BCC MW-15001 Client: Consumers Energy Location: BC Cobb Facility 151 N Causeway St. Muskegon, MI Weather Conditions: 60 F Cloudy, Windy				
DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Mater Level (f. bgs.) () Mater Level (f. bgs.) Construction				
-	- 585 -										TOC Elevation = 586.52 (ft. above msl)		
5		. 1	0.0- 6.0'	6.0	NA			<ul> <li>(0.0 - 0.1') GRASS and TOPSOIL.</li> <li>(0.1 - 1.0') SAND, fine to very fine, subround; little silt; well sorted; dr brown (10YR 3/3).</li> <li>(1.0 - 3.8') ASH, some fine to very fine sand, subround; little silt; poor to wet; dark grayish brown (10YR 4/2). NOTE: Fill material.</li> <li>(3.8 - 4.0') SAND, fine, little very fine, subround; trace to little silt; well grayish brown (10YR 5/2). NOTE: trace organic matter, trace ash.</li> <li>(4.0 - 7.0') CLAY, some silt, high plasticity, no dilatancy; trace very fir subround; medium stiff to soft; moist; gray (10YR 5/1) to grayish brow NOTE: very soft, gray (10Yr 5/1) to gray (10YR 6/1) from 6.0-7.0' bg</li> </ul>	y to moist; dark rly sorted; moist Il sorted; wet; ne sand; wn (10YR 5/2). Is.		Concrete (0.0- 1.0' bgs) 		
- 10		2	6.0- 10.0'	3.0	NA			<ul> <li>(7.0 - 7.5') CLAY, some silt, medium plasticity, slow dilatancy; trace v subround; soft; moist to wet; very dark gray (10YR 3/1). NOTE: little organic matter.</li> <li>(7.5 - 8.0') WOOD, dark gray (10YR 4/1).</li> <li>(8.0 - 9.0') CLAY and SILT, low plasticity, slow dilatancy; little very fir subround; medium stiff; moist to wet; brown (10YR 4/3). NOTE: son matter, trace to little wood.</li> <li>(9.0 - 9.1') SAND, very fine, subround; trace silt; well sorted; wet; ligh 7/2).</li> <li>(9.1 - 9.6') CLAY and SILT, high plasticity, no dilatancy; little to some subround; medium stiff; moist; brown (10YR 4/3).</li> <li>(9.6 - 20.0') SAND, fine to medium; trace to little very fine sand, subruititte silt; well sorted; wet; light brownish gray (10YR 6/2).</li> </ul>	very fine sand, e to some ne to fine sand, me organic nt gray (10Yr e very fine sand, ound; trace to				
Proje	Remarks:       bgs = below ground surface btoc = below top of casing         Hand Auger to 6.0' bgs. Groundwater encountered at 3.8' bgs during drilling. Water level at development was 5.96' btoc. No odor or staining observed. Groundwater elevation measured on November 30, 2015 was 580.84 feet         Project:       DE000722.0004.00006       Template: ARCADIS       Analytical Boring-Well 2013       New Logo       Page: 1 of 2												

Date Date Dril Dril Dril San Rig Wat	e Star e Fini ling C ler's I ling M npling Type er Le er Le	rt: 10/ sh: 10 Compa Name: Methoo g Methoo g Methoo : Soni : Vel St vel Fi	12/15 D/12/15 any: M : Johr d: Har nod: C c c c rart (ft. nish (f	o Nateco n Pitsci nd Aug Continu <b>bgs.)</b> <b>t. btoo</b>	Drillin h Jer/Sor Jous : 3.8 <b>:.):</b> 5.	g nic 96		Northing: 645763.32 Easting: 12624262.15 Casing Elevation: 586.52 Borehole Depth (ft. bgs.): 20.0 Surface Elevation: 583.6 Descriptions By: A. Westhuis	Well/Boring ID: BCC MW-15001 Client: Consumers Energy Location: BC Cobb Facility 151 N Causeway St. Muskegon, MI Weather Conditions: 60 F Cloudy, Windy				
DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level († hos.)	Well/Boring Construction			
- 15	- 570 - - - 565 -	3	10.0- 20.0'	9.0	NA			NOTE: organic matter, roots, from 18.8 to 18.9' bgs.		Sand Pack K&E WP1 (10.0- 20.0' bgs) 2" PVC 10 Slot Well Screen (10.0-20.0' bgs)			
- 25								End of boring 20.0' bgs.					
				DIS	S Des for buil	<mark>ign &amp; Co</mark> natural a t assets	insultancy and	btoc = below top of casing Hand Auger to 6.0' bgs. Groundwater encountered at 3.8' bg Water level at development was 5.9 No odor or staining observed. Groundwater elevation measured or	bloc = below top of casing Hand Auger to 6.0' bgs. Groundwater encountered at 3.8' bgs during drilling. Water level at development was 5.96' btoc. No odor or staining observed. Groundwater elevation measured on November 30, 2015 was 580.84 feet				

Dat Dat Drii Drii Sar Rig Wa Wa	e Sta e Fini lling C ller's I lling M npling Type ter Le ter Le	rt: 10/ ish: 10 Name Methoo g Metho: Soni evel St evel St evel Fi	12/15 D/12/15 any: M : Johr d: Air nod: C c c art (ft. nish (f	o Nateco Pitsc Knife/S Continu bgs.)	Drillin h Sonic Jous : 5.0 <b>c.):</b> 6.	g 45		Northing: 645701.73 Easting: 12624512.86 Casing Elevation: 586.87 Borehole Depth (ft. bgs.): 20.0 Surface Elevation: 583.8 Descriptions By: A. Westhuis	Well/Borin Client: Co Location: Weather C	Well/Boring ID: BCC MW-15002 Client: Consumers Energy Location: BC Cobb Facility 151 N Causeway St. Muskegon, MI Weather Conditions: 60 F Cloudy, Windy				
DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description		Mater Level (f. bgs.) (f. bgs.) Construction				
-	- - 585 -										TOC Elevation = 586.87 (ft. above msl)			
- - - - - - - -		1	0.0- 8.0'	4.0	NA			(0.0 - 0.1') GRASS and TOPSOIL. (0.1 - 12.0') SAND, fine to medium; trace to little very fine sand, sub sorted; moist to wet; dark brown (10YR 3/3). NOTE: Wet at 5.0' bgs.	/ round; well		Concrete (0.0- 1.0' bgs) Bentonite/Cement Grout (1.0- 11.0' bgs) PUC Well Casing (3.0- Concrete (0.0- 1.0' bgs)			
- 10 -	575 <b>-</b> -	2	8.0- 10.0'	1.0	NA	_					A     A       AA     A       AA			
- 15	- 570 - - - - - - - - - - 	3	10.0- 20.0'	7.0	NA			<ul> <li>(12.0 - 13.0') SAND, fine to medium, subround; trace silt; well sorted (10YR 5/3).</li> <li>(13.0 - 13.5') CLAY and SILT, medium plasticity, no dilatancy; little t to fine sand, subround; medium stiff, moist; brown (10YR 4/3).</li> <li>(13.5 - 20.0') SAND, fine to medium; trace to little very fine sand, su silt; well sorted; wet; light brownish gray (10YR 6/2).</li> </ul>	d; wet; brown o some very fine bround; trace		Bentonite Pellets (11.0- 13.0' bgs) Sand Pack K&E WP1 (13.0- 20.0' bgs) 2" PVC 10 Slot Well Screen (15.0-20.0' bgs)			
-	_							End of boring 20.0' bgs. Remarks: bgs = below ground surface btoc = below top of casing						
Proje	ect: DI		22.000	<b>DIS</b>	S for build	ign & Co natural a It assets	Insultancy and	Air Knife to 8.0' bgs. Groundwater encountered at 5.0' b Water level at development was 6.4 No odor or staining observed. Groundwater elevation measured of RCADIS_Analytical Boring-Well 2013_New Logo	gs during drilli 45' btoc. In November (	ing. 30, 2	2015 was 580.86 feet Page: 1 of 1			

Dat Dat Dril Dril Sar Rig Wa Wa	te Sta te Fini Iling C Iler's I Iling M mpling Type ter Le ter Le	rt: 10/ ish: 10 Name: Methoo g Meth e: Soni evel St evel Fi	12/15 D/12/15 any: M : Johr d: Air nod: ( c c art (ft. nish (f	5 /lateco n Pitsc Knife/S Continu bgs.) ft. btoo	Drillin h Sonic Jous : 11.0 <b>c.):</b> 6.	g ) 77		Northing: 645555.93 Easting: 12624726.22 Casing Elevation: 587.12 Borehole Depth (ft. bgs.): 20.0 Surface Elevation: 584.1 Descriptions By: A. Westhuis	Well/Boring ID: BCC MW-15003 Client: Consumers Energy Location: BC Cobb Facility 151 N Causeway St. Muskegon, MI Weather Conditions: 60 F Cloudy, Windy			<b>)3</b> r, Windy			
DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description		Mater Level (f. bgs.) (f. bgs.) Construction					
-	- - 585 -											<ul> <li>TOC Elevation =587.12 (ft. above msl)</li> </ul>			
		. 1	0.0- 8.0'	3.5	NA			(0.0 - 0.1') GRASS and TOPSOIL. (0.1 - 10.0') SAND, fine to medium; trace to little very fine sand, subre sorted; moist to wet; dark brown (10YR 3/3).	ound; well			<ul> <li>Concrete (0.0- 1.0' bgs)</li> <li>Bentonite/Cement Grout (1.0-9.0' bgs)</li> <li>2" PVC Well Casing (-3.0- 13.0' bgs)</li> </ul>			
- 10	- 575	2	8.0- 10.0'	1.0	NA	-		(40.0, 41.0%) CLAV and SILT, madium planticity, and dilataness little to	nome vary fine	_		- Bentonite			
-	_							(10.0 - 11.0) CLAT and SILT, including plasticity, ito dilataricy; little to to fine sand, subround; medium stiff; moist; brown (10YR 4/3). NOTE some organic matter; roots, wood. (11.0 - 18.0') SAND, fine to medium; trace to little very fine sand, sub silt; well sorted; wet; light brownish gray (10YR 6/2).	E: little to			11.0' bgs)			
Proje			22.000	DIS 04.000	S Des for buil	ign & Co natural a It assets	nsultancy ind	Remarks:       bgs = below ground surface btoc = below top of casing         Air Knife to 8.0' bgs.         Groundwater encountered at 11.0' b         Water level at development was 6.7         No odor or staining observed.         Groundwater elevation measured or         RCADIS_Analytical Boring-Well 2013_New Logo	ogs during dril 7' btoc. n November 3	 Iling. 30, 2	015 was 580.84 fee Pag	t e: 1 of 2			

Dat Dat Dril Dril Dril San Rig Wat	e Star e Fini ling C ler's I ling M npling Type ter Le ter Le	rt: 10/ ish: 10 Compa Name: Methoo g Meth s: Soni- svel St svel Fi	12/15 D/12/15 any: M : Johr d: Air nod: C c c rart (ft. nish (f	o Nateco Pitsc Knife/S Continu <b>bgs.)</b> t. btoo	Drillin h Sonic uous : 11.0 c.): 6.	g ) 77		Northing: 645555.93 Easting: 12624726.22 Casing Elevation: 587.12 Borehole Depth (ft. bgs.): 20.0 Surface Elevation: 584.1 Descriptions By: A. Westhuis	Well/Boring ID: BCC MW-15003 Client: Consumers Energy Location: BC Cobb Facility 151 N Causeway St. Muskegon, MI Weather Conditions: 60 F Cloudy, Windy			
DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description		Water Level (ft. bgs.)	Well/Boring Construction	
- 15 	- 570 - - - 565 -	3	10.0-20.0'	9.0	NA			(18.0 - 20.0') SAND, very fine to fine, subround; little to trace silt; wel grayish brown (10YR 5/2) to gray (10YR 6/1). NOTE: Organic matter; roots, leaves, wood from 18.0 to 18.3' bgs a bgs.	I sorted; wet; nd 19.0 to 19.1'		Sand Pack K&E WP1 (11.0- 20.0' bgs) 2" PVC 10 Slot Well Screen (13.0-18.0' bgs)	
- 20 - - - - - 25 -								End of boring 20.0' bgs. Remarks: bgs = below ground surface btoc = below top of casing				
	<b>A</b> /		CA	DIS	S Des for buil	ign & Co natural a t assets	nsultancy nd	Air Knife to 8.0' bgs. Groundwater encountered at 11.0' b Water level at development was 6.7 No odor or staining observed. Groundwater elevation measured o	Air Knife to 8.0' bgs. Groundwater encountered at 11.0' bgs during drilling Water level at development was 6.77' btoc. No odor or staining observed. Groundwater elevation measured on November 30,			

Date Date Dril Dril San Rig Wat	e Star e Fini ling C ler's I ling N npling Type ter Le	rt: 10/ ish: 10 Compa Name: Method g Method sy	13/15 D/13/15 any: M : Dan d: Air   nod: C c art (ft. nish (f	Mateco Moure Knife/S Continu bgs.)	Drillin er Sonic Jous : 7.0 c.): 10	g ).27		Northing: 645491.68 Easting: 12624824.48 Casing Elevation: 590.57 Borehole Depth (ft. bgs.): 20.0 Surface Elevation: 587.7 Descriptions By: A. Westhuis	Well/Boring ID: BCC MW-15004 Client: Consumers Energy Location: BC Cobb Facility 151 N Causeway St. Muskegon, MI Weather Conditions: 50 F Cloudy, Windy				
DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Mater Level (ft. bgs.) Construction				
-	- 590 - -										TOC Elevation = 590.57 (ft. above msl)		
- - - - - - - - -		1	0.0- 8.0'	3.5	NA			(0.0 - 0.1') GRASS and TOPSOIL. (0.1 - 10.0') SAND, fine; little very fine sand, subround; trace granule trace silt; well sorted; dry to moist; light yellowish brown (10YR 6/4). NOTE: Wet at 7.0' bgs.	es, subround;		Concrete (0.0- 1.0' bgs) 2" PVC Well Casing (-3.0- 5.0' bgs) Bentonite Pellets (1.0-4.0' bgs)		
- 10	580 - - - 575 -	2	80-	10.0	NA	-		(10.0 - 14.0') SAND, fine; little medium, subround; trace to little silt; v grayish brown (10YR 5/2). NOTE: Trace organice material; wood at 13.5' bgs.	vell sorted; wet;	_	Sand Pack K&E WP1 (4.0-20.0' bgs) 2" PVC 10 Slot Well Screen (5.0-15.0' bgs)		
- 15 - - -	- - 570 - -		20.0'					(14.0 - 17.0') SAND, medium; little coarse sand, subround; trace gra subround; little silt; well sorted; wet; grayish brown (10YR 5/2). NOTE: Organic matter, wood; dark brown (10YR 3/3) from 16.5 to 1 (17.0 - 20.0') SAND, very fine to fine, subround; little silt; well sorted; brown (10YR 5/2).	7.0' bgs. wet; grayish				
_	-												
F	Remarks:       bgs = below ground surface btoc = below top of casing         Air Knife to 8.0' bgs.       Air Knife to 8.0' bgs.         Groundwater encountered at 7.0' bgs during drilling.       Water level at development was 10.27' btoc.         No odor or staining observed.       Groundwater elevation measured on November 30, 2015 was 580.82 feet												

Data File: BCC-MW-15004.dat Date: 2/8/2016 Created/Edited by: C. Jeffers

Date Dril Dril Dril San Rig Wat	e Sta e Fini ling C ler's I ling N npling Type ter Le ter Le	rt: 10/ ish: 10 Compa Name: Methoo g Meth e: Soni evel St evel St	13/15 0/13/15 any: M : Dan d: Air nod: ( c c art (ft. nish (f	5 Mateco Moure Knife/S Continu bgs.) t. btoo	Drillin er Sonic Jous : 6.0 <b>:.):</b> 7.	g .61		Northing: 645166.74 Easting: 12624783.15 Casing Elevation: 587.77 Borehole Depth (ft. bgs.): 20.0 Surface Elevation: 584.8 Descriptions By: A. Westhuis	166.74 4783.15 ion: 587.77Well/Boring ID: BCC MW-15005th (ft. bgs.): 20.0 tion: 584.8Client: Consumers Energyby: A. WesthuisLocation: BC Cobb Facility 151 N Causeway St. Muskegon, MIBy: A. WesthuisWeather Conditions: 50 F Cloudy				
DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Mater Level (# bgs.) (# bgs.) Well/Boring Construction				
-	- - 585 -										TOC Elevation = 587.77 (ft. above msl)		
	- - 580 -	1	0.0- 6.0'	6.0	NA	-		(0.0 - 0.1') GRASS and TOPSOIL. (0.1 - 10.0') SAND, fine; little very fine sand, subround; trace granule little to trace silt; well sorted; moist to wet; pale brown (10YR 6/3).	es, subround;		Concrete (0.0- 1.0' bgs) 2" PVC Well Casing (-3.0- 5.0' bgs) Bentonite Pellets (1.0-4.0' bgs)		
-	- - 575 -	2	6.0- 10.0'	4.0	NA			(10.0 - 10.5') SAND, fine, subround; little silt; well sorted; wet; very d	lark gray (10YR		Sand Pack K&E		
- 10 - - - - - - - - - - - - - - - - - - -	- - 570 - - - - - - - - - - - - - 	3	10.0-20.0'	8.0	NA			3/1). NOTE: trace organic matter, large wood fragments. (10.5 - 20.0') SAND, fine to medium; trace coarse sand, subround; li well sorted; wet; grayish brown (10YR 5/2).	ttle to trace silt;		bgs) 2" PVC 10 Slot Well Screen (5.0-15.0' bgs)		
-	-							End of boring 20.0' bgs.					
P	<b>)</b> /-	AR(	CA	DIS	S Des for bui	s <mark>ign &amp; Co</mark> natural a It assets	nsultancy ind	Remarks: bgs = below ground surface btoc = below top of casing Air Knife to 6.0' bgs. Groundwater encountered at 6.0' bg Water level at development was 7.6 No odor or staining observed. Groundwater elevation measured o	gs during drillin 31' btoc. n November 30	ıg. 0, 20	)15 was 580.54 feet		

Data File: BCC-MW-15005.dat Date: 2/8/2016 Created/Edited by: C. Jeffers

Date Date Drill Drill San Rig Wat	e Sta e Fini ling C ler's I ling M npling Type er Le er Le	rt: 10/ ish: 10 Compa Name: Methoo g Methoo g Methoo : Soni evel St evel St	13/15 D/13/15 any: M : Dan d: Air nod: ( c art (ft. nish (f	5 Mateco Moure Knife/S Continu bgs.) ft. btoo	Drillin er Sonic Jous : 5.0 <b>:.):</b> 7.	g .45		Northing: 645291.65 Easting: 12624610.52 Casing Elevation: 587.81 Borehole Depth (ft. bgs.): 20.0 Surface Elevation: 584.9 Descriptions By: A. Westhuis	191.65 (610.52) ion: 587.81Well/Boring ID: BCC MW-15006Client: Consumers Energyth (ft. bgs.): 20.0 tion: 584.9Location: BC Cobb Facility 151 N Causeway St. Muskegon, MIBy: A. WesthuisWeather Conditions: 50 F Cloudy					
DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Mater Level (f. bgs.) Water Level (f. bgs.) Construction					
-	-									TOC Elevation = 587.81 (ft. above msl)				
5 	580 - - - - - - - - - - - - - - - - - - -	1	0.0- 10.0' 10.0- 20.0'	4.0	NA			(0.0 - 0.1') LANDSCAPING STONE. (0.1 - 9.0') SAND, fine, subround; trace granules, subround; trace sil moist to wet; light yellowish brown (10YR 6/4). NOTE: Wet at 5.0' bgs. (9.0 - 20.0') SAND, fine to medium, subround; trace granules, subrou wet; light brownish gray (10YR 6/2).	t; well sorted;	Concrete (0.0- 1.0' bgs) 2" PVC Well Casing (-3.0- 5.0' bgs) Bentonite Pellets (1.0-4.0' bgs) 2" PVC 10 Slot Well Screen (5.0-15.0' bgs)				
<u>- 20</u> -	<u>- 565</u>						<u></u>	End of boring 20.0' bgs.						
P			CA	DIS	S Des for buil	s <mark>ign &amp; Co</mark> natural a It assets	nsultancy ind	Remarks: bgs = below ground surface btoc = below top of casing Air Knife to 6.0' bgs. Groundwater encountered at 5.0' bg Water level at development was 7.4 No odor or staining observed. Groundwater elevation measured o	gs during drilling 5' btoc. n November 30,	, 2015 was 581.14 feet				
Date Date Dril Dril Dril San Rig Wat	e Star e Fini ling C ler's I ling M npling Type er Le er Le	rt: 10/ sh: 10 Compa Name: Methoo g Meth :: Soni vel St vel Fi	14/15 0/14/1{ any: M : Dan d: Air nod: ( c c cart (ft. nish (f	5 /lateco Moure Knife/S Contine bgs.) ft. bto	Drillin er Sonic uous : 5.0 c.): 6.	.78		Northing: 645409.39 Easting: 12624188.85 Casing Elevation: 587.43 Borehole Depth (ft. bgs.): 20.0 Surface Elevation: 584.5 Descriptions By: A. Westhuis	Client: Consumers Energy Location: BC Cobb Facility 151 N Causeway St. Muskegon, MI Weather Conditions: 50 F Cloudy					
---	---	--	---	---	--	-------------------------------------	-----------------	---	--	--	--	--	--	--
DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	(jt pds:) Water Level (ft bds:) Construction					
-	- - 585 -								TOC Elevatio = 587.43 (ft. above msl)					
		1	0.0- 10.0'	2.0	NA			(0.0 - 0.1') GRASS and TOPSOIL. (0.1 - 10.0') SAND, very fine to fine, subround; trace granules to sam subround; little to trace silt; well sorted; moist to wet; brown (10YR 5/	nll pebble, //3). Concrete (0.0 1.0' bgs) 2" PVC Well Casing (-3.0- 4.0' bgs) Bentonite Pellets (1.0-3 bgs) Sand Pack K. WP1 (3.0-20. bgs) 2" PVC 10 Sk Well Screen (4.0-10.0' bgs)					
- 10	-		CA	DIS	S Des for bui	sign & Co natural a lt assets	sultancy	(10.0 - 10.5') CLAY and SILT, medium to high plasticity, no dilatancy, sand, subround; soft to very soft, dark brown (10'YR 3/3). NOTE: litt matter; roots. (10.5 - 11.2') SAND, very fine, subround; trace granules, subround; I sorted; wet; grayish brown (10'YR 5/2). NOTE: trace to little organic and wood (dark brown (10'YR 3/3). (11.2 - 11.7') CLAY and SILT, high plasticity, no dilatancy; soft; dark 3/3). <b>Remarks:</b> bgs = below ground surface btoc = below top of casing Air Knife to 9.0' bgs. Groundwater encountered at 5.0' bg Water level at development was 6.7 No odor or staining observed.	y: trace very fine tle organic little silt; poorly matter; roots brown (10YR gs during drilling. 78' btoc.					

Date Date Dril Dril Dril San Rig Wat	e Star e Fini ling C ler's I ling M npling Type ter Le ter Le	rt: 10/ ish: 10 Compa Name: Methoo g Meth s: Sonic svel St svel Fin	14/15 )/14/15 any: M : Dan d: Air I nod: C c art (ft. nish (f	; Moure Knife/S Contini bgs.); t. btoo	Drillin er Sonic uous : 5.0 <b>c.):</b> 6.	g 78		Northing: 645409.39 Easting: 12624188.85 Casing Elevation: 587.43 Borehole Depth (ft. bgs.): 20.0 Surface Elevation: 584.5 Descriptions By: A. Westhuis	Well/Boring Client: Cor Location: E	g ID nsun BC ( 151 Mus ond	9: <b>BCC MW-15007</b> mers Energy Cobb Facility N Causeway St. kegon, MI l <b>itions:</b> 50 F Cloudy
DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description		Water Level (ft. bgs.)	Well/Boring Construction
- - - - - -		2	10.0-20.0'	8.0	NA			<ul> <li>(11.7 - 12.5') SAND, very fine to fine, subround; little silt; poorly sorted brown (10YR 6/3).</li> <li>NOTE: Organic rich matter roots and wood; dark brown (10YR 3/3) for 12.5' bgs.</li> <li>(12.5 - 20.0') SAND, fine to medium; little very fine sand, subround; t sorted; wet; light brownish gray (10YR 6/2).</li> <li>NOTE: Organic matter wood; dark brown (10YR 3/3) from 19.5 to 20</li> </ul>	d; wet; pale from 12.0 to race silt; well		
- 25								<b>Remarks:</b> bgs = below ground surface			
		ARCADIS Design & Consultancy for natural and built assets Design & Consultancy for undwater encountered at 5.0' bgs during dril Water level at development was 6.78' btoc. No odor or staining observed. Groundwater elevation measured on November							ıs during drillir 8' btoc. n November 3	ng. 80, 2	2015 was 581.13 feet

Data File: BCC-MW-15007.dat

Dat Dat Dril Dril Sar Rig Wa Wa	e Star e Fini lling C ller's I lling M npling Type ter Le ter Le	rt: 10/ ish: 10 Compa Name: Methoo g Meth : Soni- svel St svel Fi	14/15 D/14/1 any: M : Dan d: Air nod: ( c c art (ft. nish (f	5 /lateco Moure Knife/: Contin bgs.) ft. bto	Drillin er Sonic uous : 4.5 c.): 7.	g .11		Northing: 645340.01 Easting: 12623510.47 Casing Elevation: 587.76 Borehole Depth (ft. bgs.): 20.0 Surface Elevation: 584.8 Descriptions By: A. Westhuis	Well/Boring Client: Cor Location: E	Client: Consumers Energy Location: BC Cobb Facility 151 N Causeway St. Muskegon, MI Weather Conditions: 60 F Partly Cloudy				
DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description		Water Level (ft. bgs.)	Well/Boring Construction			
-											TOC Elevation = 587.76 (ft. above msl)			
- 5		1	0.0- 10.0'	3.0	NA			(0.0 - 0.1') LANDSCAPING STONE. (0.1 - 9.5') SAND, fine to very fine, subround; trace granules to smal subround; little silt; well sorted; moist to wet; brown (10YR 5/3). NOTE: Wet at 4.5' bgs.	l pebble,		Concrete (0.0- 1.0' bgs) 2" PVC Well Casing (-3.0- 4.0' bgs) Bentonite Pellets (1.0-3.0' bgs) Sand Pack K&E WP1 (3.0-20.0' bgs) 2" PVC 10 Slot Well Screen (4.0-9.0' bgs)			
- 10	575 -					-		(9.5 - 12.0') SAND, fine, little medium sand, subround; little to trace s wet; grayish brown (10YR 5/2).	silt; well sorted;					
Proje	A A			DIS 04.000	S Des for bui	i <mark>ign &amp; Co</mark> natural a It assets	nsultancy ind	Remarks:       bgs = below ground surface btoc = below top of casing         Air Knife to 8.0' bgs.         Groundwater encountered at 4.5' bg         Water level at development was 7.1         No staining observed.         Groundwater elevation measured o         RCADIS_Analytical Boring-Well 2013_New Logo	gs during drillir 1' btoc. n November 3	ng. 0, 20 <sup>,</sup>	15 was 580.99 feet Page: 1 of 2			

Dat Dat Dril Dril Dril San Rig Wat	e Sta e Fini ling C ler's l ling M npling Type ter Le ter Le	rt: 10/ ish: 10 Compa Name: Methoo g Methor s: Sonic evel St evel Fir	14/15 D/14/15 any: M Dan d: Air nod: C c art (ft. nish (f	5 Moure Knife/S Continu bgs.) t. btoo	Drillin er Sonic uous : 4.5 c.): 7.	g 11		Northing: 645340.01 Easting: 12623510.47 Casing Elevation: 587.76 Borehole Depth (ft. bgs.): 20.0 Surface Elevation: 584.8 Descriptions By: A. Westhuis	ng ID: BCC MW-15008 Insumers Energy BC Cobb Facility 151 N Causeway St. Muskegon, MI Conditions: 60 F Partly Cloudy			
DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description		Water Level (ft. bgs.)	Well/Boring Construction	
- - 15	- 570 -	2	10.0-20.0'	9.0	NA			<ul> <li>(12.0 - 13.0') SAND, fine, little medium sand, subround; little to some sorted; wet; dark grayish brown (10YR 4/2). NOTE: wood fragments (10YR 3/1), slight odor at 12.0' bgs.</li> <li>(13.0 - 13.5') CLAY and SILT, low plasticity, no dilatancy; little to tract fine sand, subround; soft; dark brown (10YR 3/3). NOTE: little organ roots.</li> <li>(13.5 - 15.5') SAND, fine, subround; some silt; poorly sorted; wet; br NOTE: trace organics.</li> </ul>	e silt; poorly s; very dark gray 			
-			20.0					(15.5 - 20.0') SAND, fine to medium; trace silt; well sorted; wet; gray (10YR 5/2).	rish brown			
- <del>20</del> -	-							End of boring 20.0' bgs.				
- 25	560 — _ _ _							<b>Remarks:</b> bgs = below ground surface				
Proje	Remarks: bgs = below ground surface btoc = below top of casing         Air Knife to 8.0' bgs. Groundwater encountered at 4.5' bgs during drilling. Water level at development was 7.11' btoc. No staining observed. Groundwater elevation measured on November 30, 2015 was 580.99 feet         oject: DE000722.0004.00006       Template: ARCADIS_Analytical Boring-Well 2013_New Logo											

Dat Dat Dril Dril Dril Sar Rig Wa	e Star e Fini lling C ller's I lling M npling Type ter Le ter Le	rt: 10/ ish: 10 Compa Name Metho g Metho g Metho Soni evel St evel St evel Fi	(14/15 0/14/15 any: M : Dan d: Air nod: ( c c tart (ft. nish (f	5 Mateco Moure Knife/S Continu <b>bgs.)</b> ft. btoo	Drillin er Sonic Jous : 0.5 <b>:.):</b> 7.	g 51		Northing: 645606.92 Easting: 12623622.98 Casing Elevation: 589.27 Borehole Depth (ft. bgs.): 24.0 Surface Elevation: 586.3 Descriptions By: A. Westhuis	Well/Borin Client: Col Location: Weather C	g ID nsur BC ( 151 Mus ond	D: BCC MW-15009 mers Energy Cobb Facility N Causeway St. skegon, MI ditions: 60 F Partly Cloudy	
DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description		Water Level (ft. bgs.)	Well/Boring Construction	
-	590 — _ _ _										TOC Eleval = 589.27 (ft above msl)	tion t.
- 0								(0.0 - 8.0') NO RECOVERY, soils not logged, air knife soil cuttings d approved area.	isposed in CE		Concrete (0 1.0' bgs)	).0-
- 5	- 580 -	1	0.0- 8.0'	0.0	NA			NOTE: Wet at 4.5' bgs.			2" PVC We Casing (-3. 14.0' bgs)	:ll 0- Cemen
-	_	2	8.0- 10.0'	2.0	NA	-	× × × × × × × ×	(8.0 - 10.0') ASH, rapid dilatancy; wet; soft; very dark gray (10YR 3/ material. Little to trace organic matter; roots and wood fragments.	1). NOTE: Fill	-		
- 10	-							(10.0 - 12.0') CLAY and SILT, low plasticity, no dilatancy; some to lit fine sand, subround; soft; dark brown (10YR 3/3).	tle very fine to			
Proie	A A		<b>CA</b>	DIS 04.000	S pes for buil	ign & Co natural a It assets	nsultancy nd	Remarks:       bgs = below ground surface btoc = below top of casing         Air Knife to 8.0' bgs.         Groundwater encountered at 0.5' bg         Water level at deveopment was 7.5         No odor or staining observed.         Groundwater elevation measured o         RCADIS Analytical Boring-Well 2013 New Logo	gs during drilli 1' btoc. n November 3	ng. 30, 2	2015 was 581.88 feet Page: 1 of 2	

Date Date Dril Dril San Rig Wat	e Star e Fini ling C ler's I ling M npling Type er Le er Le	rt: 10, ish: 1 Compa Name Aetho g Metl : Soni evel Si evel Fi	(14/15 0/14/15 any: M : Dan d: Air nod: ( c tart (ft. nish (f	Mateco Moure Knife/S Continu bgs.)	Drillin er Sonic Jous : 0.5 <b>:.):</b> 7.	g 51		Northing: 645606.92 Easting: 12623622.98 Casing Elevation: 589.27 Borehole Depth (ft. bgs.): 24.0 Surface Elevation: 586.3 Descriptions By: A. Westhuis	ing: 645606.92 ng: 12623622.98 g Elevation: 589.27Well/Boring ID: BCC MW-15009 Client: Consumers Energycole Depth (ft. bgs.): 24.0 ce Elevation: 586.3Location: BC Cobb Facility 151 N Causeway St. Muskegon, MIiptions By: A. WesthuisWeather Conditions: 60 F Partly Cloudy			
DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction		
-	575 -	3	10.0- 15.0'	4.0	NA			(12.0 - 17.2') SAND, fine, subround; litte silt; well sorted; wet; brown NOTE: Some clay, low plasticity, no dilatancy; soft; dark brown (10Y	(10YR 4/3). R 3/3).	Bentonite Pellets (11.0- 13.0' bgs)		
- 20	- 570 -	4	15.0- 20.0'	5.0	NA			NOTE: Some organic rich matter, roots and wood; wet; very dark br from 17.0 to 17.2' bgs. (17.2 - 24.0') CLAY and SILT, low plasticity, no dilatancy; little to trac fine sand, subround; soft; dark brown (10YR 3/3). NOTE: little orga roots.	own (10YR 2/2) re very fine to nic matter,	Sand Pack K&E WP1 (13.0- 24.0 bgs) 2" PVC 10 Slot Well Screen (14.0-24.0' bgs)		
-	- 565 -	5	20.0-24.0'	4.0	NA			End of boring 24.0' bgs.				
- 25	-											
F	<b>^</b>	AR(	CA	DIS	S Des for buil	<mark>ign &amp; Co</mark> natural a It assets	nsultancy	Remarks: bgs = below ground surface btoc = below top of casing Air Knife to 8.0' bgs. Groundwater encountered at 0.5' bg Water level at deveopment was 7.5 No odor or staining observed. Groundwater elevation measured of	ls during drilling. 1' btoc. n November 30,	2015 was 581.88 feet		

Date Date Drill Drill San Rig Wat Wat	e Star e Fini ling C ler's I ling M npling Type ter Le ter Le	rt: 10/ sh: 10 Compa Name: Methoo g Meth : Soni vel St vel Fi	14/15 D/15/15 any: M : Dan d: Air nod: C c c art (ft. nish (f	5 Mateco Moure Knife/S Contine <b>bgs.)</b> it. bto	Drillin er Sonic uous : 0.3 c.): 6.	g .93		Northing: 645690.69 Easting: 12623979.47 Casing Elevation: 588.11 Borehole Depth (ft. bgs.): 24.0 Surface Elevation: 585.2 Descriptions By: A. Westhuis	Well/Borin Client: Col Location:   Weather C	BC 151 Mus	D: BCC MW-150 mers Energy Cobb Facility N Causeway St. skegon, MI ditions: 60 F Partly	<b>10</b> Cloudy
DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description		Water Level (ft. bgs.)	Well/Bori Construct	ng ion
-	-											<ul> <li>TOC Elevation</li> <li>= 588.11 (ft. above msl)</li> </ul>
-	- 585						× × × × × × × × × × × × × × × × × × ×	(0.0 - 0.3') STONE, parking lot aggregate. (0.3 - 10.0') ASH, some fine sand, subround; little granules to small p subround; wet; soft; very dark gray (10YR 3/1). NOTE: Fill material.	pebble			<ul> <li>— Concrete (0.0- 1.0' bgs)</li> <li>— 2" PVC Well</li> </ul>
	580 -	1	0.0-10.0'	3.0	NA							Casing (-3.0- 12.0' bgs) Bentonite/Cemem Grout (1.0-9.0' bgs)
- 10	575 -					-	×	(10.0 - 24.0') SAND, very fine to fine; trace to little medium sand, sub silt; well sorted; wet; grayish brown (10YR 5/2).	pround; trace			<ul> <li>Bentonite</li> <li>Pellets (9.0-</li> <li>11.0' bgs)</li> </ul>
C	<b>)</b> /	R	CA	DIS	S for bui	s <mark>ign &amp; Co</mark> natural a It assets	insultancy and	Kemarks:       bgs = below ground surface btoc = below top of casing         Air Knife to 8.0' bgs.       Groundwater encountered at 0.3' bg Water level at development was 6.9 No odor or staining observed.         Groundwater elevation measured or       Groundwater elevation measured or	gs during drilli 3' btoc. n November 3	ng. 30, 2	2015 was 581.42 fee	et

Dat Dat Dril Dril Dril San Rig Wat	e Star e Fini ling C ler's I ling M npling Type ter Le ter Le	rt: 10/ ish: 10 Compa Name Methor g Methor g Methor svel State svel State svel State	(14/15 0/15/1{ any: M : Dan d: Air nod: ( c c tart (ft. nish (f	5 Mateco Moure Knife/S Contine <b>bgs.)</b> it. btoo	Drillin er Sonic uous : 0.3 c.): 6.	g .93		Northing: 645690.69 Easting: 12623979.47 Casing Elevation: 588.11 Borehole Depth (ft. bgs.): 24.0 Surface Elevation: 585.2 Descriptions By: A. Westhuis	Well/Boring II Client: Consu Location: BC 151 Mus Weather Cond	ID: BCC MW-15010 sumers Energy C Cobb Facility 51 N Causeway St. luskegon, MI nditions: 60 F Partly Cloudy		
DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction		
- - - - - - - - - - - - - - - - - - -	570	2	10.0- 20.0' 20.0- 24.0'	8.0	NA			NOTE: Little silt and organic matter near 17.0' bgs.		Sand Pack K&E WP1 (11.0- 22.0' bgs) 2" PVC 10 Slot Well Screen (12.0-22.0' bgs)		
	_							End of boring 24.0' bgs.				
⊢ 25	560 -											
Proje	Remarks: bgs = below ground surface btoc = below top of casing         Air Knife to 8.0' bgs. Groundwater encountered at 0.3' bgs during drilling. Water level at development was 6.93' btoc. No odor or staining observed. Groundwater elevation measured on November 30, 2015 was 581.42 feet         oject: DE000722.0004.00006       Template: ARCADIS_Analytical Boring-Well 2013_New Logo											

Dat Dat Dril Dril Dril Sar Rig Wat	e Star e Fini ling C ler's I ling M npling Type ter Le ter Le	rt: 10/ ish: 1 Compa Name Aetho g Metho g Metho : Soni evel St evel Fi	(15/15 0/15/15 any: N : Dan d: Air nod: ( c tart (ft. nish (f	5 Mateco Moure Knife/S Continu bgs.) t. btoo	Drillin er Sonic uous : 6.5 c.): 13	g 3.03		Northing: 64578029 Easting: 12623765.87 Casing Elevation: 595.22 Borehole Depth (ft. bgs.): 32.0 Surface Elevation: 592.3 Descriptions By: A. Westhuis	Well/Borin Client: Cor Location:   Weather C	g IE nsur BC 151 Mus onc	D: BCC MW-15011 mers Energy Cobb Facility N Causeway St. skegon, MI ditions: 60 F Partly Cloudy	
DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description		Water Level (ft. bgs.)	Well/Boring Construction	
-	- 595 - -										TOC Elevation = 595.22 (ft. above msl)	
-	- 590 -						× × × × × × × × × × × ×	(0.0 - 0.1') GRASS, ROOTS and ASH. (0.1 - 18.0') ASH, non-plastic, rapid dilatancy, little fine sand, subrou sorted; soft; wet; gray (10YR 5/1) to dark gray (10YR 4/1). NOTE:	/ und; poorly Fill material.		Concrete (0.0- 1.0' bgs)	
- 5	- 585 - -	1	0.0-	3.0	NA		× × × × × × × × × × × × × × × × × × ×	NOTE: Wet at 6.5' bgs.			AAA         AAA           AAA         AAAA           AAAA         AAAAAA           AAAA         AAAAAA	
- 10 - - - - 15	- 580 -	2	10.0-	9.0	NA		* * * * * * * * * * * * * * * * * * * *	NOTE: Laminated from 13.5 to 15.0' bgs.			A A A A A A A A A A A A A A A A A A A	
Proje	Remarks:       bgs = below ground surface btoc = below top of casing         Air Knife to 9.0' bgs.       Groundwater encountered at 6.5' bgs during drilling.         Water level at development was 13.03' btoc.       No staining observed.         Groundwater elevation measured on November 30, 2015 was 582.13 feet											

Dat Dat Dril Dril Sar Rig Wa	e Star e Fini lling C ller's I lling M npling Type ter Le ter Le	rt: 10/ ish: 10 Name Methor g Methor g Methor soni svel St svel Fi	(15/15 0/15/15 any: M : Dan d: Air nod: C c tart (ft. nish (f	5 Mateco Moure Knife/S Continu bgs.) t. bto	Drillin er Sonic uous : 6.5 c.): 13	g 3.03		Northing: 64578029 Easting: 12623765.87 Casing Elevation: 595.22 Borehole Depth (ft. bgs.): 32.0 Surface Elevation: 592.3 Descriptions By: A. Westhuis	Well/Boring Client: Con Location: E 1 M Weather Co	ng ID: BCC MW-15011 onsumers Energy : BC Cobb Facility 151 N Causeway St. Muskegon, MI Conditions: 60 F Partly Cloudy		
DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description		Mater Level (ft. bgs.) Well/Boring Construction		
-	_ 575 <b>_</b> _						× × × × × · · ·	(18.0 - 19.0') CLAY and SILT, medium to high plasticity, no dilatancy; soft; moist; dark brown (10YR 3/3). NOTE: organic rich, some wood slight odor. (19.0 - 26.0') SAND, fine, subround; some to little silt; well sorted; we gray (10YR 6/2).	; medium stiff to and roots; t; light brownish	A     A		
- 20	_ 570 — _											
- 25 - -	_ 565 — _	3	20.0- 32.0'	9.0	NA			(26.0 - 27.0') SAND, fine, little medium sand, subround; little silt; poor dark grayish brown (10YR 4/2). NOTE: organic rich, some roots and (27.0 - 32.0') SAND, fine, little very fine sand, subround; trace silt; we light brownish gray (10YR 6/2).	rly sorted; wet; d wood. Ill sorted; wet;	- Sand Pack K&E WP1 (20.0- 32.0' bgs) 2" PVC 10 Slot Well Screen (21.0-31.0' bgs)		
- 30	- 560 -							End of boring 32.0' bgs.				
- 35	Remarks: bgs = below ground surface btoc = below top of casing											
					5 for buil	natural a It assets	Ind	Suitancy an Kine to 9.0 bgs. Groundwater encountered at 6.5' bgs during drilling. Water level at development was 13.03' btoc. No staining observed. Groundwater elevation measured on November 30, 2015 was 582.13 feet				

Dat Dat Dril Dril Dril Sar Rig Wa Wa	e Star e Fini lling C ller's I lling M npling Type ter Le ter Le	rt: 10/ ish: 10 Name Methor g Methor s: Soni evel St evel Fi	(15/15 0/15/1 (15/1) any: M : Dan d: Air nod: ( c c tart (ft. nish (f	5 Mateco Moure Knife/: Contin bgs.) ft. bto	Drillin er Sonic uous : 8.0 c.): 1:	g 3.79		Northing: 645889.92 Easting: 12623545.99 Casing Elevation: 597.39 Borehole Depth (ft. bgs.): 35.0 Surface Elevation: 594.5 Descriptions By: A. Westhuis	Well/Boring ID: BCC MW-15012 Client: Consumers Energy Location: BC Cobb Facility 151 N Causeway St. Muskegon, MI Weather Conditions: 60 F Partly Cloudy		
DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description		Water Level (ft. bgs.)	Well/Boring Construction
_	- - 595 -										TOC Elevation = 597.39 (ft. above msl)
	- - - 590 - - - - - - 585 -	1	0.0- 10.0'	3.0	NA			(0.0 - 0.1') GRASS, ROOTS and ASH. (0.1 - 9.0') SAND, fine, subround, and ASH; little silt; poorly sorted; w grayish brown (10YR 4/2). NOTE: Wet at 8.0' bgs. (9.0 - 18.0') ASH, little fine sand, subround; non-plastic, rapid dilatar sorted; wet; soft; gray (10YR 5/1). NOTE: Fill material.	vet; soft; dark		Concrete (0.0- 1.0' bgs)
- 10	- - 580 -	2	10.0- 20.0'	9.0	NA		× × × × × × × × × × × × × × × × × × ×	NOTE: Laminated from 13.0-15.0' bgs.			Bentonite/Cemer Grout (1.0- 18.0' bgs)
Proje	A A		<b>CA</b>	DI\$	S bui	ign & Co natural a It assets	nsultancy ind	Remarks: bgs = below ground surface btoc = below top of casing Air Knife to 9.0' bgs. Groundwater encountered at 8.0' by Water level at development was 13 No staining observed. Groundwater elevation measured o RCADIS_Analytical Boring-Well 2013 New Logo	js during drillir 79' btoc. n November 3	ng. 0, 2	2015 was 583.46 feet Page: 1 of 2

Dat Dat Dril Dril Dril Sar Rig Wat	e Star e Fini lling C ller's I lling M npling Type ter Le ter Le	rt: 10/ ish: 10 Compa Name Methor g Methor g Methor s Soni svel St evel Fi	15/15 D/15/15 any: M : Dan d: Air nod: C c c rart (ft. nish (f	5 Moure Knife/S Continu bgs.) t. btoo	Drillin er Sonic uous : 8.0 c.): 13	g 3.79		Northing: 645889.92 Easting: 12623545.99 Casing Elevation: 597.39 Borehole Depth (ft. bgs.): 35.0 Surface Elevation: 594.5 Descriptions By: A. Westhuis	45889.92       Well/Boring ID: BCC MW-15012         623545.99       Client: Consumers Energy         vation: 597.39       Location: BC Cobb Facility         evation: 594.5       151 N Causeway St.         ms By: A. Westhuis       Weather Conditions: 60 F Partly Cloudy							
DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description		Water Level (ft. bgs.)	Well/Boring Construction					
20	_ 						× × ×	(18.0 - 19.0') CLAY and SILT, medium plasticity, no dilatancy; moist soft; dark brown (10YR 3/3). NOTE: organic rich; some wood and r odor. (19.0 - 30.0') SAND, fine, subround; little silt; well sorted; wet; light b (10YR 6/2). NOTE: trace organics; dark brown (10YR 3/3).	; medium stiff to oots; slight rownish gray		Bentonite Pellets (18.0- 20.0' bgs)					
25			20.0-25.0'	5.0	NA						Sand Pack K&E					
	- - 565 -	3	25.0- 30.0	5.0	NA					_	WP1 (20.0- 35.0' bgs) 2" PVC 10 Slot Well Screen (21.0-31.0' bgs)					
-	- - 560 -		30.0- 35.0	5.0	NA			(30.0 - 35.0') SAND, fine, subround; little silt; well sorted; wet; light b (10YR 6/2).	rownish gray							
	Remarks: bgs = below ground surface btoc = below top of casing Air Knife to 9.0' bgs. Groundwater encountered at 8.0' bgs during drilling. Water level at development was 13.79' btoc. No staining observed. Groundwater elevation measured on November 30, 2015 was 583.46 feet															

 Project:
 DE000722.0004.00006
 Template:
 ARCADIS\_Analytical Boring-Well 2013\_New Logo

 Data
 File:
 BCC-MW-15012.dat
 Date:
 2/8/2016
 Created/Edited by:
 C. Jeffers

Dat Dat Dri Dri Sar Rig Wa Wa	te Sta te Fini Iling C Iler's I Iling M mpling Type ter Le ter Le	rt: 10/ ish: 1 Compa Name Metho g Metho s: Soni evel St evel Fi	(15/15 0/16/1 any: M : Dan d: Air nod: ( c c tart (ft. nish (f	5 Mateco Moure Knife/S Contine bgs.) ft. btoo	Drillin er Sonic uous : 9.5 c.): 1(	ıg 6.38		Northing: 645716.41 Easting: 12623389.21 Casing Elevation: 598.5 Borehole Depth (ft. bgs.): 40.0 Surface Elevation: 595.9 Descriptions By: A. Westhuis	Well/Boring Client: Cor Location: E	g ID nsum BC C 151 I Musk ondi	: <b>BCC MW-15013</b> ners Energy Cobb Facility N Causeway St. kegon, MI <b>itions:</b> 60 F Partly Cloudy
DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description		Water Level (ft. bgs.)	Well/Boring Construction
-	-										TOC Elevation = 598.50 (ft. above msl)
	595 - - - - - 590 - - - -	- - - - - -	0.0- 10.0'	5.0	NA			(0.0 - 0.1') GRASS, ROOTS and ASH. (0.1 - 9.5') SAND, fine, subround, and ASH; poorly sorted; moist; yel (10YR 5/6) to dark yellowish brown (10YR 3/6).	/ lowish brown		Concrete (0.0- 1.0' bgs)
- 10 - - - 15 - - - - - - - - - - - - - - - - - - -	- 585 - - - - 580 - - - - - - 575 -	2	10.0-20.0'	9.0	NA	-		<ul> <li>(9.5 - 10.5') ASH, little fine sand, subround; non-plastic, rapid dilatan sorted; wet; soft; gray (10YR 5/1) to dark gray (10YR 4/1). NOTE: F</li> <li>(10.5 - 13.5') SAND, fine to medium, and ASH; trace coarse sand, st sorted; moist to wet; dark yellowish brown (10YR 4/4) to brown (10Y</li> <li>(13.5 - 28.0') ASH; little fine sand, subround; non-plastic, rapid dilata sorted; wet; very soft; gray (10YR 5/1) to grayish brown (10YR 5/2).</li> </ul>	cy; poorly ill material. //bround; poorly R 4/3).		2" PVC Well Casing (-3.0- 30.0' bgs) Bentonite/Cemem Grout (1.0- 27.0' bgs)
Proje	a /			DIS 04.000	S per for bui	sign & Co natural a lt assets	nsultancy ind	Remarks: bgs = below ground surface Air Knife to 9.0' bgs. Groundwater encountered at 9.5' bg Water level at development was 16. No odor or staining observed. Groundwater elevation measured or above mean sea level. RCADIS_Analytical Boring-Well 2013_New Logo	ıs during drillir 38' btoc. n November 3	ng.	015 was 582.33 feet Page: 1 of 2

Dat Dat Dril Dril Dril Sar Rig Wa	e Sta e Fini lling C ller's I lling M npling Type ter Le ter Le	rt: 10/ ish: 10 Compa Name: Methoo g Meth : Soni- evel St evel Fi	15/15 D/16/15 any: M : Dan d: Air nod: C c art (ft. nish (f	5 Iateco Moure Knife/S Continu bgs.) t. btoo	Drillin er Sonic Jous : 9.5 <b>c.):</b> 10	g 6.38		Northing: 645716.41 Easting: 12623389.21 Casing Elevation: 598.5 Borehole Depth (ft. bgs.): 40.0 Surface Elevation: 595.9 Descriptions By: A. Westhuis	Well/Boring Client: Cor Location: E	g II nsu BC 151 Mus ond	D: BCC MW-15013 mers Energy Cobb Facility N Causeway St. skegon, MI ditions: 60 F Partly Cloudy
DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description		Water Level (ft. bgs.)	Well/Boring Construction
-	-		20.0- 25.0'	4.0	NA		× × × × ×				
- 25	570 - - - -	3	25.0- 30.0	5.0	NA		× × × × × ×	(28.0 - 36.0') SAND, fine, trace medium sand, subround; trace silt; we light gray (10YR 7/2) to very pale brown (10YR 7/3).	ell sorted; wet;	-	Bentonite Pellets (27.0- 29.0' bgs)
35	565 <del>-</del> - -		30.0- 35.0	5.0	NA						Sand Pack K&E WP1 (29.0-
-	560 <del>-</del> - -		35.0- 40.0	4.0	NA			<ul> <li>(36.0 - 36.5') SAND, fine, subround; trace silt and organics; light gray dark yellowish brown (10'YR 4/4). NOTE: some leaves and small sti (36.5 - 37.5') CLAY and SILT, low plasticity to non-plastic, no dilatane medium stiff; dark brown (10'YR 3/3). NOTE: some organics, leaves wood.</li> <li>(37.5 - 40.0') SAND, fine, subround; trace silt; well sorted; wet; light gray and subround; trace silt; well sorted; well; light gray and subround; trace silt; well sorted; well; light gray and subround; trace silt; well sorted; well; light gray and subround; trace silt; well sorted; well; light gray and subround; light gray and subround; sorted; well; light gray and subround; sorted; well; light gray and subround; sorted; well; light gray and subround; light</li></ul>	(10YR 7/1) to cks. cy; moist; , roots and // rray (10YR 7/2).		40.0 bgs) 2" PVC 10 Slot Well Screen (30.0-40.0' bgs)
- 40 - -								End of boring 40.0' bgs.			
- - 45 -	- 550 -										
F	Remarks: bgs = below ground surface Air Knife to 9.0' bgs. Groundwater encountered at 9.5' bgs during drilling. Water level at development was 16.38' btoc. No odor or staining observed. Groundwater elevation measured on November 30, 2015 was 582.33 feet above mean sea level.							2015 was 582.33 feet			

Dat Dat Dri Dri Sar Rig Wa Wa	te Sta te Fini lling C ller's I lling M mpling Type ter Le ter Le	rt: 10/ ish: 10 Compa Name Metho g Metho g Metho : Soni evel St evel St evel Fi	16/15 0/16/15 any: M : Dan d: Air nod: ( c c cart (ft. nish (f	5 Mateco Moure Knife/S Contine bgs.) ft. btoo	Drillin er Sonic uous : 14.0 c.): 1	ıg ) 5.50		Northing: 645925.93 Easting: 12623318.73 Casing Elevation: 599.04 Borehole Depth (ft. bgs.): 40.0 Surface Elevation: 596.2 Descriptions By: A. Westhuis	Well/Borin Client: Cor Location: I	g ID: nsum BC C 151 N Musk ondi	BCC MW-15014 hers Energy sobb Facility N Causeway St. legon, MI tions: 60 F Partly Cloudy
DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description		Water Level (ft. bgs.)	Well/Boring Construction
-	- 600 - -										TOC Elevation = 599.04 (ft. above msl)
- - - - - - - - -	- 595 - - - - 590 - - - - -	. 1	0.0- 10.0'	3.0	NA			(0.0 - 0.1') GRASS, ROOTS and ASH. (0.1 - 14.0') SAND, fine to medium, subround, and ASH; poorly sorte wet; brown (10YR 5/3) to dark grayish brown (10YR 4/2). NOTE: Fill	/ d; soft; moist to material.		Concrete (0.0- 1.0' bgs)
- 15		2	10.0-20.0'	9.0	NA	_		<ul> <li>(14.0 - 14.5') ASH, little fine sand, subround; non-plastic, rapid dilata sorted; wet; soft; very dark grayish brown (10YR 5/2) to dark gray (10 NOTE: Fill material. Little to trace organics; roots.</li> <li>(14.5 - 17.5') ASH, non-plastic, rapid dilatancy; poorly sorted; wet; so (10YR 4/1). NOTE: Fill material.</li> <li>(17.5 - 20.0') ASH, non-plastic, rapid dilatancy; poorly sorted; wet; so brown (10YR 5/2) to dark gray (10YR 4/1). NOTE: Fill material, lamit</li> <li>(20.0 - 27.0') SAND. fine, subround: trace silt; well sorted; wet; light to the sorted; wet; so the sorted is the sorted; here the sorted; here the sorted; here the sorted; here the sorted; wet; light the sorted; here there the sorted; he</li></ul>	ncy; poorly DYR 4/1). oft; dark gray oft; grayish nated.	-	A         2" PVC Well           Casing (-3.0- 23.0' bgs)         Casing (-3.0- 23.0' bgs)           A         Sentonite/Cemem Grout (1.0- 20.0' bgs)           A         A
•	575 -		CA	DIS	S Destor	sign & Co natural a lt assets	nsultancy	Remarks: bgs = below ground surface btoc = below top of casing Air Knife to 9.25' bgs. Groundwater encountered at 14.0' b Water level at development was 15. No odor or staining observed. Groundwater elevation measured or	m 20.0 to 20.5' ogs during dril 50' btoc. n November 3	ling.	D15 was 583.19 feet

Dat Dat Drii Drii Sar Rig Wa Wa	te Stat le Fini lling C ller's I lling M mpling Type ter Le ter Le	rt: 10/ ish: 10 Compa Name Metho g Metho g Metho: Soni evel Sta evel Fi	16/15 0/16/15 any: M : Dan d: Air nod: ( c c cart (ft. nish (f	5 Mateco Moure Knife/S Continu <b>bgs.)</b> it. btoo	Drillin er Sonic Jous : 14.0 <b>: 1</b> 5	g ) 5.50		Northing: 645925.93 Easting: 12623318.73 Casing Elevation: 599.04 Borehole Depth (ft. bgs.): 40.0 Surface Elevation: 596.2 Descriptions By: A. Westhuis	Well/Boring Client: Con Location: B 1 M Weather Co	ng ID: BCC MW-15014 onsumers Energy BC Cobb Facility 151 N Causeway St. Muskegon, MI Conditions: 60 F Partly Cloudy	
DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description		Mater Level (ft. bgs.) Construction	
- 25 	- - 570 - - -	3	20.0- 30.0'	8.0	NA			(27.0 - 31.0') SAND, fine, subround; some silt; little clay; poorly sorter brownish gray (10YR 6/2). NOTE: little to some organics, roots and to 27.1' bgs and at 30.0' bgs.	d; wet; light wood from 27.0	Sand Pack K WP1 (22.0- 40.0' bgs) 2" PVC 10 SI Well Screen (23.0-31.0' bg	(&E lot gs)
- 35		4	30.0- 40.0	9.0	NA			<ul> <li>(31.0 - 34.0') SAND and SILT; trace clay; non-plastic, rapid dilatancy; sorted; soft; dark grayish brown (10YR 4/2). NOTE: rich organic lay; and wood.</li> <li>(34.0 - 36.0') SAND, fine, subround; little silt; well sorted; wet; light br (10YR 6/2).</li> <li>(36.0 - 37.5') SAND, fine, and ORGANICS; poorly sorted; wet; dark b 3/3) to light gray (10YR 7/2).</li> <li>(37.5 - 39.0') SAND, fine, subround; well sorted; wet; light brownish g (39.0 - 40.0') CLAY and SILT, low plasticity to non-plastic, no dilatance medium stiff; dark brown (10YR 3/3).</li> <li>End of boring 40.0' bgs.</li> </ul>	; wet; poorly er; some roots ownish gray prown (10YR gray (10YR 6/2). cy; moist;		
- 45			CA	DIS	5 Des for built	ign & Co natural a t assets	nsultancy nd	Remarks: bgs = below ground surface btoc = below top of casing Air Knife to 9.25' bgs. Groundwater encountered at 14.0' b Water level at development was 15. No odor or staining observed. Groundwater elevation measured or	igs during drilli 50' btoc. n November 30	illing. 30, 2015 was 583.19 feet	

Dat Dat Dril Dril Dril Sar Rig Wa Wa	te Sta ling C lier's I ling M npling Type ter Le ter Le	rt: 10/ ish: 10 Compa Name: Methoo g Methoo s: Soni evel St evel Fi	16/15 0/19/15 any: M : Dan d: Air nod: ( c c c art (ft. nish (f	5 Mateco Moure Knife/S Contine bgs.)	Drillin er Sonic uous : 8.5 c.): 12	ıg 2.16		Northing: 646138.93 Easting: 12623024.09 Casing Elevation: 596.75 Borehole Depth (ft. bgs.): 30.0 Surface Elevation: 593.9 Descriptions By: A. Westhuis	Well/Boring Client: Cons Location: Bo 15 M Weather Co	ID: BCC N sumers Ener C Cobb Faci 51 N Causev uskegon, M nditions: 6	<b>/IW-15015</b> gy lity vay St. 0 F Partly Cloudy
DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description		water Level (It. bgs.)	Well/Boring Construction
-	- 595 -										TOC Elevation = 596.75 (ft. above msl)
- - - - - - - - - - - - - - -		· 1	0.0-10.0'	2.0	NA			(0.0 - 8.5') SAND, fine to medium, and ASH, subangular; poorly sor grayish brown (4/2). NOTE: Fill material. (8.5 - 14.0') ASH, non-plastic, rapid dilatancy; wet; soft; very dark gr (10YR 3/2). NOTE: Fill material.	ted; moist; dark		Concrete (0.0- 1.0' bgs)
- - Proje			<b>CA</b>	DIS 04.000	S Dee bui	sign & Ca natural a t assets	× × × × × × × × × ×	NOTE: Wood fragments at 14.0' bgs.         Remarks:       bgs = below ground surface btoc = below top of casing         Air Knife to 8.5' bgs.         Groundwater encountered at 8.5' b         Water level at development was 12 No odor or staining observed.         Groundwater elevation measured c         JRCADIS_Analytical Boring-Well 2013_New Logo	gs during drilling .16' btoc. on November 30	g.	580.81 feet Page: 1 of 2

Date Date Drill Drill San Rig Wat Wat	e Star e Fini ling C ler's I ling M npling Type er Le er Le	rt: 10/ ish: 1 Compa Name Metho g Metho g Metho : Soni evel St evel Fi	(16/15 0/19/15 any: M : Dan d: Air nod: ( c c tart (ft. nish (f	5 Mateco Moure Knife/S Continu bgs.) t. btoo	Drillin er Sonic Jous : 8.5 <b>: 8</b> .5	ıg 2.16		Northing: 646138.93 Easting: 12623024.09 Casing Elevation: 596.75 Borehole Depth (ft. bgs.): 30.0 Surface Elevation: 593.9 Descriptions By: A. Westhuis	Well/Boring Client: Cor Location: E	g ID: E Insume BC Col I51 N Muskey onditio	BCC MW-15015 rs Energy bb Facility Causeway St. gon, MI ons: 60 F Partly Cloudy
DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description		Water Level (ft. bgs.)	Well/Boring Construction
- 15 - - - 20 - - - 25 - - - - 30	- - - - - - - - - - - - - - - - - - -	2	10.0- 20.0'	9.0	NA			(14.0 - 17.0') SAND, fine, subround; well sorted; wet; light brownish NOTE: light yellowish brown (10YR 6/4) from 14.0-16.0' bgs; pale 6/3) from 1617.0' bgs. (17.0 - 19.0') FILL material, wood fragments; brown (10YR 4/3) to ve (10YR 2/2). (19.0 - 29.0') SAND, fine, subround; trace silt; well sorted; wet; light (10YR 6/4). NOTE: Little clay and silt at 27.0' bgs. (29.0 - 29.5') CLAY and SILT, low to medium plasticity, no dilatancy subround; moist; medium stiff; brown (10YR 4/3). NOTE: organic ri 29.5' bgs. (29.5 - 30.0') SAND, fine, subround; trace silt; well sorted; wet; light (10YR 6/4).	gray (10YR 6/4). brown (10YR ery dark brown brownish gray ; little fine sand, ch, wood near brownish gray		Bentonite Pellets (17.0- 19.0' bgs) Sand Pack K&E WP1 (19.0- 30.0' bgs) 2" PVC 10 Slot Well Screen (20.0-30.0' bgs)
Proje	-			DIS 04.000	S Person for buil	sign & Co natural a It assets	insultancy and	Remarks: bgs = below ground surface btoc = below top of casing Air Knife to 8.5' bgs. Groundwater encountered at 8.5' bg Water level at development was 12 No odor or staining observed. Groundwater elevation measured o	gs during drillir .16' btoc. nn November 3	ng. 0, 201	5 was 580.81 feet Page: 2 of 2

Dat Dat Dri Dri Dri Sar Rig Wa Wa	e Sta e Fini lling C ller's I lling M npling Type ter Le ter Le	rt: 10/ ish: 10 Compa Name Methor g Methor g Methor s Soni s vel Sta vel Sta	19/15 0/19/15 any: M : Dan d: Air nod: ( c c cart (ft. nish (f	5 Mateco Moure Knife/S Continu bgs.) ft. btoo	Drillin er Sonic Jous : 8.5 <b>: 8</b> .5	.65		Northing: 646227.56 Easting: 12622459.2 Casing Elevation: 5 Borehole Depth (ft.) Surface Elevation: 5 Descriptions By: A.	6         Well           89.05         Clien           bgs.): 45.0         Loca           586.2         Westhuis	I/Boring II nt: Consu ation: BC 151 Mu: ather Con	D: BCC MW-15016 Imers Energy Cobb Facility I N Causeway St. skegon, MI ditions: 60 F Partly Cloudy
DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic	c Description	Water Level (ft. bgs.)	Well/Boring Construction
- - -	- 590 - -										TOC Elevation = 589.05 (ft. above msl)
		1	0.0- 10.0'	3.0	NA			(0.0 - 15.0') SAND, fine to medium, and moist to wet; dark grayish brown (10YR fragments.	ASH; little coarse, subround; poorly s 4/2). NOTE: Fill material, trace coal	;orted;	Concrete (0.0- 1.0' bgs)
- - - - - -	575 - - - 570 - - - -	2	10.0- 20.0'	10.0	NA			(15.0 - 17.0') SAND, fine, subround; little (10YR 6/4). (17.0 - 19.0') FILL material, wood fragm (10YR 4/3) to very dark brown (10YR 2/	e silt; well sorted; wet; light brownish g ents; some fine sand, subround; brow 2).	gray /n ;, no	^^         ^^           ^^         <
- 20 - -	- 565 - -							dilatancy; medium stiff; well sorted; wet; NOTE: organic rich matter, leaves, stick 21.0 to 25.0' bgs.	light brownish gray (10YR 6/4). s, wood; moist; dark brown (10YR 3/3	3) from	
Proje	A /-		22.000	DIS 04.000	S for build	sign & Co natural a lt assets	nsultancy nd	Remarks: bgs = below g btoc = below to Air Knife to 8.5 Groundwater e Water level at No odor or sta Groundwater e CADIS_Analytical Boring-Well	round surface op of casing 5' bgs. encountered at 8.5' bgs durir development was 8.65' btoc ining observed. elevation measured on Nove 2013_New Logo	ng drilling. S. ember 30,	2015 was 580.08 feet Page: 1 of 2

Dat Dat Dril Dril Dril Sar Rig Wat	e Star e Fini lling C ller's I lling N mpling Type ter Le ter Le	rt: 10/ sh: 1 Name Metho g Meth : Soni vel St vel Fi	(19/15 0/19/15 any: M : Dan d: Air nod: ( c tart (ft. nish (f	5 Mateco Moure Knife/S Continu bgs.): t. btoo	Drillin er Sonic Jous : 8.5 <b>:.):</b> 8.	g 65		Northing: 646227.56 Easting: 12622459.26 Casing Elevation: 589.05 Borehole Depth (ft. bgs.): 45.0 Surface Elevation: 586.2 Descriptions By: A. Westhuis	Well/Boring ID: E Client: Consumer Location: BC Col 151 N Musker Weather Condition	BCC MW-15016 rs Energy bb Facility Causeway St. gon, MI ons: 60 F Partly Cloudy
DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
- 25 - - - 30		3	20.0- 30.0'	10.0	NA			<ul> <li>(25.0 - 27.0') SAND, fine, subround; trace silt; well sorted; wet; light (10YR 6/4).</li> <li>(27.0 - 28.5') CLAY and SILT, low plasticity to non-plastic, no dilatal sand, subround; moist; soft; dark brown (10YR 3/3). NOTE: organi roots.</li> <li>(28.5 - 28.8') SAND, fine, subround; trace silt; well sorted; wet; light (10YR 6/4).</li> <li>(28.8 - 35.0') CLAY and SILT, low plasticity to non-plastic, no dilatal sorted; wet; light (10YR 6/4).</li> </ul>	brownish gray ncy; little fine c rich, trace brownish gray	
- - - - - -	555 - - - - 550 - - - -	4	30.0- 40.0'	9.0	NA			NOTE: Trace shell fragments at 34.0' bgs. (35.0 - 37.0') SAND, fine, subround; little silt; well sorted; wet; yellow (10YR 5/4). (37.0 - 40.5') SAND, fine, subround; trace silt; well sorted; wet; pale 6/3). NOTE: Trace small pebble, subround at 39.0' bgs.	vish brown brown (10YR	Bentonite Pellets (32.0- 34.0' bgs) Sand Pack K&E WP1 (34.0- 45.0' bgs) 2" PVC 10 Slot Well Screen (35.0-40.0' bgs)
- 40 - - - - -	545 - - - - 540 -	5	40.0- 45.0'	5.0	NA			(40.5 - 45.0') CLAY, high plasticity, no dilatancy; trace silt; moist; most; soft; gray (10YR 7/1).	edium stiff to	
- - -	-		CA	DIS	5 Des for bui	ign & Co natural a It assets	nsultancy	Remarks: bgs = below ground surface btoc = below top of casing Air Knife to 8.5' bgs. Groundwater encountered at 8.5' b Water level at development was 8.1 No odor or staining observed. Groundwater elevation measured of	gs during drilling. 55' btoc. on November 30, 201	5 was 580.08 feet

Data File: BCC-MW-15016.dat

Dat Dat Dril Dril San Rig Wat	e Star e Fini ling C ler's I ling M npling Type ter Le ter Le	rt: 10/ sh: 10 compa Name: Method g Meth : Sonid vel St vel Fin	19/15 0/20/18 any: M : Dan d: Air d: Air c art (ft. nish (f	5 Mateco Moure Knife/S Continu bgs.)	Drillin er Sonic uous : 8.0 c.): 8. c.): 8.	g .53		Northing: 646354.69 Easting: 12622085.55 Casing Elevation: 588.61 Borehole Depth (ft. bgs.): 40.0 Surface Elevation: 585.7 Descriptions By: A. Westhuis	Well/Borin Client: Cor Location: I	g ID nsur BC ( 151 Mus ond	D: BCC MW-15017 mers Energy Cobb Facility N Causeway St. kegon, MI litions: 60 F Partly Cloudy, Windy
DEPTH (feet bgs.)	ELEVATION	Sample Run Numbe	Sample/Int/Type	Recovery (feet)	PID Headspace (ppi	Analytical Sample	Geologic Column	Stratigraphic Description		Water Level (ft. bgs.	Well/Boring Construction
- - -	-										TOC Elevation = 588.61 (ft. above msl)
- 5	585	1	0.0- 10.0'	3.0	NA			(0.0 - 11.0') SAND, fine to medium, subround, and ASH; little coarse subround; poorly sorted; moist to wet; very dark grayish brown (10YI Fill material. NOTE: Wet at 9.0' bgs; trace coal fragments.	sand, R 3/2). NOTE:		Concrete (0.0- 1.0' bgs)
- 15	575	2	10.0- 20.0'	9.0	NA			<ul> <li>(11.0 - 14.0') SAND, fine, subround, and SILT; trace clay, non-plastic moist to wet; poorly sorted; soft; dark brown (10YR 3/3) to light brow 6/2). NOTE: little to trace organic matter, sticks, wood, and leaves.</li> <li>(14.0 - 15.0') CLAY and SILT, low plasticity to non-plastic, no dilatan sand subround; moist; soft; dark brown (10YR 3/3).</li> <li>(15.0 - 18.5') SAND, fine, subround; little to trace silt; well sorted; we gray (10YR 6/4).</li> <li>(18.5 - 20.0') FILL material, wood fragments; some fine sand, subrou (10YR 4/3) to dark brown (10YR 3/3). NOTE: Trace sticks and leaves.</li> </ul>	c, no dilatancy; nish gray (10YR cy; little fine t; light brownish t; light brownish es.	-	A     A
Proio	A A		22 000			ign & Co natural a lt assets	nsultancy nd	Image: V(20.0 - 20.5') SAND, fine, subround; trace silt; well sorted; wet; pale brown (10YR)       Image: V(20.0 - 20.5') SAND, fine, subround; trace silt; well sorted; wet; pale brown (10YR)         Remarks:       bgs = below ground surface         Air Knife to 8.0' bgs.       Groundwater encountered at 8.0' bgs during drilling.         Water level at development was 8.53' btoc.       No odor or staining observed.         Groundwater elevation measured on November 30, 2015 was 579.99 feet above mean sea level.       Backs 1 of 2			

Data File: BCC-MW-15017.dat

Dat Dat Dril Dril Dril San Rig Wat	e Star e Fini lling C ller's I lling N mpling Type ter Le ter Le	rt: 10/ ish: 10 Compa Name: Methoo g Meth : Soni- vel St vel St	19/15 D/20/15 any: M Dan d: Air I nod: C c art (ft. nish (f	ateco Moure Knife/S Continu <b>bgs.)</b> <b>t. btoo</b>	Drillin er Sonic Jous : 8.0 <b>:.):</b> 8.	g .53		Northing: 646354.69 Easting: 12622085.55 Casing Elevation: 588.61 Borehole Depth (ft. bgs.): 40.0 Surface Elevation: 585.7 Descriptions By: A. Westhuis	Well/Borin Client: Col Location: Weather C	BC 151 Mus	D: BCC MW-15017 mers Energy Cobb Facility N Causeway St. skegon, MI ditions: 60 F Partly Cloudy, Windy
DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description		Water Level (ft. bgs.)	Well/Boring Construction
	565 - - - 560 - - - - - - - - - - - - - - - - - - -	3	20.0- 30.0'	9.0	NA			<ul> <li>6/3).</li> <li>(20.5 - 21.5') SAND, fine, subround; trace silt; trace wood; poorly so brown (10YR 6/3) to dark brown (10YR 3/3).</li> <li>NOTE: Organic rich matter, wood, sticks; dark brown (10YR 3/3) from bgs.</li> <li>(21.5 - 22.0') SAND, fine subround; trace silt; well sorted; wet; pale the formation of the subround; trace silt; well sorted; wet; pale the formation of the subround; trace silt; solt; brown (10YR 3/3).</li> <li>(23.5 - 33.0') CLAY and SILT, non-plastic, no dilatancy; some fine samoist; solt; brown (10YR 3/3).</li> </ul>	rted; wet; pale		
- - - - - - - - - - - - - - -	555 - - - 550 - - - - - - - - - - - - - - - - - - -	4	30.0- 40.0'	9.0	NA			NOTE: Some wood and sticks; trace shell fragments at 33.0' bgs. (33.0 - 35.0') SAND, fine, subround; trace silt; well sorted; wet; yello (35.0 - 40.0') SAND, fine, subround; trace silt; well sorted; wet; pale 6/3). End of boring 40.0' bgs.	w (10YR 7/6). brown (10YR		Bentonite Peilets (32.0- 34.0' bgs) Sand Pack K&E WP1 (34.0- 45.0' bgs) 2" PVC 10 Slot Well Screen (35.0-40.0' bgs)
-	ARCADIS Design & Consultance for natural and built assets							Remarks: bgs = below ground surface Air Knife to 8.0' bgs. Groundwater encountered at 8.0' bg Water level at development was 8.5 No odor or staining observed. Groundwater elevation measured o above mean sea level.	gs during drilli 3' btoc. n November 3	ng.	2015 was 579.99 feet

Dat Dat Dri Dri Dri Sar Rig Wa Wa	te Sta te Fini Iling C Iler's I Iling M mpling Type ter Le ter Le	rt: 10/ ish: 1 Compa Name Metho g Metho g Metho s: Soni evel Si evel Fi	20/15 0/20/15 any: M : Dan d: Air nod: ( c c tart (ft. nish (f	5 Mateco Moure Knife/S Contine bgs.) ft. btoo	Drillin er Sonic uous : 8.0 c.): 1	g 1.78		Northing: 646789.54 Easting: 12622179.74 Casing Elevation: 592.43 Borehole Depth (ft. bgs.): 45.0 Surface Elevation: 589.4 Descriptions By: A. Westhuis	Well/Boring Client: Con Location: E 1 N Weather Co	g ID: BCC Insumers Ene BC Cobb Fac 151 N Cause Muskegon, M onditions: 6	<b>MW-15018</b> rgy sility way St. II 60 F Cloudy
DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description		Water Level (ft. bgs.)	Well/Boring Construction
-	- - 590 -										TOC Elevation = 592.43 (ft. above msl)
-0	_						<del>.</del>	(0.0 - 0.3') STONE, aggregate for road base.	/		Concrete (0.0-
5 10		. 1	0.0- 10.0'	3.0	NA	-	× × × × × × × × × × × × × × × × × × ×	(0.3 - 14.0') ASH, trace to little fine sand, subround; non-plastic; slov moist to wet; soft; very dark gray (10YR 3/1). NOTE: Fill material.	v dilatancy;		1.0' bgs)
- - - - - -	- - 575 - - - -	2	10.0- 20.0'	9.0	NA			(14.0 - 23.0') SAND, fine, subround; some silt; trace granules; trace sorted; wet; light brownish gray (10YR 6/4). NOTE: Some large wo 17.5' and 20.0' bgs.	clay; poorly od fragments at		2" PVC Well Casing (-3.0- 37.5' bgs) Bentonite/Cement
- 20	570 <del>-</del> -					_		NOTE: Increase in silt at 20.0' bgs	D 2/2) from 22.0		Grout (1.0- 34.5' bgs)
6	<b>a</b> /-	AR(	CA	DIS	S Des for bui	i <mark>ign &amp; Co</mark> natural a It assets	nsultancy	Remarks: bgs = below ground surface btoc = below top of casing Air Knife to 8.5' bgs. Groundwater encountered at 8.0' bg Water level at development was 11 No odor or staining observed. Groundwater elevation measured o	gs during drillir .78' btoc. n November 3	ng. 0, 2015 was	580.08 feet

Dat Dat Dril Dril Sar Rig Wa Wa	te Stat le Fini lling C ller's I lling M mpling Type ter Le ter Le	rt: 10/ ish: 10 Compa Name: Methoo g Metho: Soni evel St evel St evel Fi	20/15 D/20/15 any: M : Dan d: Air nod: ( c c art (ft. nish (f	5 Mateco Moure Knife/S Continu <b>bgs.)</b> : <b>t. btoc</b>	Drillin er Sonic Jous : 8.0 <b>:.):</b> 1 <sup>-</sup>	g 1.78		Northing: 646789.54 Easting: 12622179.74 Casing Elevation: 592.43 Borehole Depth (ft. bgs.): 45.0 Surface Elevation: 589.4 Descriptions By: A. Westhuis	Well/Boring ID: BCC MW-15018 Client: Consumers Energy Location: BC Cobb Facility 151 N Causeway St. Muskegon, MI Weather Conditions: 60 F Cloudy							
DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Mater Level (ft. bgs.) Construction							
- - - - - - - - - - 30 -		3	20.0- 30.0'	10.0	NA			<ul> <li>(23.0 - 25.5') SAND, fine, subround; some silt; poorly sorted; wet; ligh gray (10YR 6/4). NOTE: wood debris from 24.0 to 24.3' bgs.</li> <li>NOTE: Organic rich matter, wood, sticks, leaves; dark brown (10YR to 25.5' bgs.</li> <li>(25.5 - 27.5') SAND, fine, subround; little to some silt; well sorted; we gray (10YR 6/4). NOTE: wood debris, sticks; brown (10YR 3/3) from bgs.</li> <li>(27.5 - 28.0') CLAY and SILT, low plasticity to non-plastic, no dilatance sand, subround; moist; soft; dark brown (10YR 3/3).</li> <li>(28.0 - 30.0') SAND, fine, subround, and SILT; wet; poorly sorted; soft gray (10YR 6/4). to dark brown (10YR 3/3). NOTE: little wood debris near 29.0' bgs.</li> <li>(30.0 - 37.0') CLAY and SILT, low plasticity to non-plastic, no dilatance sand, subround; moist; medium stiff to soft; dark brown (10YR 3/3).</li> <li>(30.0 - 37.0') CLAY and SILT, low plasticity to non-plastic, no dilatance sand, subround; moist; medium stiff to soft; dark brown (10YR 3/3).</li> <li>(30.0 - 37.0') CLAY and SILT, low plasticity to non-plastic, no dilatance sand, subround; moist; medium stiff to soft; dark brown (10YR 3/3).</li> </ul>	Int brownish         It 3/3) from 25.0         et; light brownish         m 26.0 to 26.3'         incy; little fine         off; light browish         s, organic rich         incy; trace fine         o very dark         nite shell							
- 35 40	555 - - - - 550 - -	4	30.0- 40.0'	10.0	NA			(37.0 - 42.5') SAND, fine, subround; well sorted; wet; very pale brown	m (10YR 7/3).							
- - 	- - 545 - - - -	5	40.0- 45.0'	5.0	NA			(42.5 - 45.0') CLAY, high plasticity, no dilatancy; trace silt; moist; med soft; gray (10YR 7/1). End of boring 45.0' bgs.	edium stiff to							
	540 ARCADIS Design & Consultan for natural and built assets ext: DE000722.0004.00006 Template:							Remarks:							Remarks: bgs = below ground surface btoc = below top of casing Air Knife to 8.5' bgs. Groundwater encountered at 8.0' bg Water level at development was 11. No odor or staining observed. Groundwater elevation measured or	gs during drilling. .78' btoc. n November 30, 2015 was 580.08 feet

 Project:
 DE000722.0004.00006
 Template:
 ARCADIS\_Analytical Boring-Well 2013\_New Logo

 Data
 File:
 BCC-MW-15018.dat
 Date:
 2/8/2016
 Created/Edited by:
 C. Jeffers

Da Da Dri Dri Dri Sa Rig Wa Wa	te Sta te Fini Iling C Iler's I Iling N mpling Type ter Le ter Le	rt: 10/ ish: 10 Compa Name Methoo g Methoo g Methoo s: Soni evel St evel St evel Fi	20/15 0/20/1{ any: M : Dan d: Air nod: ( c c cart (ft. nish (f	5 Mateco Moure Knife/S Contine bgs.) ft. btoo	Drillin er Sonic uous : 7.0 c.): 12	g 2.22		Northing: 647103.13 Easting: 12622369.93 Casing Elevation: 592.42 Borehole Depth (ft. bgs.): 45.0 Surface Elevation: 589.4 Descriptions By: A. Westhuis	Well/Boring ID: BCC MW-15019 Client: Consumers Energy Location: BC Cobb Facility 151 N Causeway St. Muskegon, MI Weather Conditions: 60 F Cloudy				
DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Mater Level (11 bgs:) (11 bgs:) Construction				
-	_ _ 590 —								TOC Elevat = 592.42 (ft. above msl)	ion			
	_							(0.0 - 0.3') STONE, aggregate for road base.	Concrete (0	.0-			
	- 585 - - - - - - - - - - - - - - - - - - -	1	0.0- 10.0'	4.0	NA		* * * * * * * * * * * * *	(0.3 - 13.0') ASH, little fine sand, subround; trace granules, subangu slow to rapid dilatancy; moist to wet; soft; very dark gray (10YR 3/1). material.	Jar; non-plastic, NOTE: Fill				
- - 15 - -	- 575 - - - -	2	10.0-20.0'	9.0	NA		< ×	<ul> <li>(13.0 - 15.0') SAND, fine, subround; little to some silt; well sorted; we (10YR 6/3).</li> <li>(15.0 - 18.0') SAND, fine, subround; some silt; well sorted; wet; grayi (10YR 5/2).</li> <li>NOTE: Large wood fragments at 17.0' bgs.</li> <li>(18.0 - 18.5') SAND, fine, subround; and SILT; poorly sorted; wet; da 3/3). NOTE: some organic matter; sticks; wood.</li> <li>(18.5 - 26.0') SAND, fine, little silt; trace medium sand, subround; we liteht brownich error (10YR 6/2).</li> </ul>	vet; pale brown vish brown lark brown (10YR rell sorted; wet;	II )- :ememi			
- 20	_					-							
Proje	= A	gs during drilling. 2.22' btoc. on November 30, 2015 was 580.11 feet Page: 1 of 2											

Dat Dat Dri Dri Sar Rig Wa Wa	e Star e Fini lling C ller's I lling N mpling Type ter Le ter Le	rt: 10/ sh: 10 Compa Name Metho g Methor : Soni vel St vel St	20/15 0/20/18 any: M : Dan d: Air nod: ( c c c art (ft. nish (f	Mateco Moure Knife/S Continu bgs.)	Drillin er Sonic uous : 7.0 c.): 12	ıg 2.22		Northing: 647103.13 Easting: 12622369.93 Casing Elevation: 592.42 Borehole Depth (ft. bgs.): 45.0 Surface Elevation: 589.4 Descriptions By: A. Westhuis	Well/Boring ID: BCC MW-15019 Client: Consumers Energy Location: BC Cobb Facility 151 N Causeway St. Muskegon, MI Weather Conditions: 60 F Cloudy		
DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Mater Level (ft. bgs.) Construction		
- 25 - 25 		3	20.0- 30.0' 30.0- 40.0' 40.0'	9.0	NA			<ul> <li>(26.0 - 27.0') CLAY and SILT, non-plastic, no dilatancy; little fine sa moist; soft; dark brown (10YR 3/3).</li> <li>(27.0 - 27.5') SAND, fine, subround; little silt; well sorted; wet; light I (10YR 6/2). NOTE: some organic debris, sticks.</li> <li>(27.5 - 29.0') SAND, fine, subround; and SILT; trace clay, non-plast dilatancy; poorly sorted; wet; brown (10YR 4/3) to dark brown (10YI (29.0 - 30.0') SAND, fine, subround; some silt; trace clay; poorly sort brownish gray (10YR 6/2). NOTE: some roots, sticks and wood.</li> <li>(30.0 - 31.5') CLAY and SILT, low plasticity, no dilatancy; little to trasubround; moist; soft to medium stiff, dark brown (10YR 3/3). NOT (31.5 - 32.5') SAND, fine, subround, and SILT; poorly sorted; wet; g (10YR 5/2).</li> <li>(32.5 - 37.0') CLAY and SILT, low plasticity, no dilatancy; little fine s moist; medium stiff, dark brown (10YR 3/3). NOTE: ganic rich; trace fragments at 32.5 to 36.5' bgs.</li> <li>(37.0 - 42.0') SAND, fine, subround; trace silt; well sorted; wet; pale 6/3).</li> <li>(42.0 - 45.0') CLAY, high plasticity, no dilatancy; trace silt; moist; m</li></ul>	Ind, subround; brownish gray ic, slow R 3/3). rted; wet; light ic, slow R 3/3). rted; wet; light ic, slow R 3/3). rted; wet; light ic, slow R 3/3). red; white shell ic, slow R 3/3). red; wet; light ic, slow R 3/3). red; white shell ic, slow R 3/3). red; wet; light ic, slow R 3/3)		
- 45-	545 -		CA	DIS	S Dee for buil	sign & Co natural a lt assets	prosultancy	End of boring 45.0' bgs.  Remarks: bgs = below ground surface btoc = below top of casing Air Knife to 8.5' bgs. Groundwater encountered at 7.0' b Water level at development was 12 No odor or staining observed	ngs during drilling. 2.22' btoc.		
Broid	act: DI	=0007	22 000	14 000	<u>06 T</u>	emn	late: Al	Groundwater elevation measured o	on November 30, 2015 was 580.11 feet		

Da Da Dri Dri Dri Sa Rig Wa Wa	te Sta te Fini Iling ( Iler's Iling M mpling Type ter Le ter Le	rt: 10/ ish: 1 Compa Name Metho g Metho g Metho : Soni evel St evel Fi	21/15 0/21/1{ any: M : Dan d: Air nod: ( c c cart (ft. nish (f	5 Mateco Moure Knife/S Contine <b>bgs.)</b> ft. btoo	Drillin er Sonic Jous : 7.0 <b>c.):</b> 12	g 2.19		Northing: 647436.97 Easting: 12622626.85 Casing Elevation: 592.23 Borehole Depth (ft. bgs.): 45.0 Surface Elevation: 589.5 Descriptions By: A. Westhuis	Well/Boring ID: BCC MW-15020 Client: Consumers Energy Location: BC Cobb Facility 151 N Causeway St. Muskegon, MI Weather Conditions: 60 F Partly Cloudy		
DEPTH (feet bgs.) LEVATION ample Run Number ample/Int/Type Recovery (feet) PID Headspace (ppm) nalytical Sample ceologic Column							Geologic Column	Stratigraphic Description		(ff pgs) Water Level (ff bgs) Construction	
-	- - 590 -										TOC Elevation = 592.23 (ft. above msl)
- - - - - - - - -	- - - 585 - - - - - - - - - - - - - - - - - 	1	0.0- 10.0'	0.0	NA			(0.0 - 10.0') NO RECOVERY; most soil cuttings from air knife were n int the hole.	ot placed back		Concrete (0.0- 1.0' bgs)
- 10 - - - - - - - - - -	- - 575 - - - -	2	10.0-20.0'	5.0	NA			<ul> <li>(10.0 - 18.0') SAND, fine, subround; some ash; little medium sand; tr small pebble, subangular; moist to wet; poorly sorted; very dark gray (10YR 3/2). NOTE: little large stones; road base fill material.</li> <li>(10YR 3/2). NOTE: little large stones; road base fill material.</li> <li>(10YR 3/2). NOTE: little large stones; road base fill material.</li> </ul>	ace granules to ish brown ancy; wet; soft;		2" PVC Well Casing (-3.0- 35.0' bgs) Bentonite/Ceme Grout (1.0- 32.5' bgs)
- 20 - -	570 - - -					-	×	(20.0 - 31.0') SAND fine, subround; little silt; well sorted; wet; light br (10YR 6/2).	ownish gray		
Proje	A /			DIS 04.000	S Des for buil	iign & Co natural a It assets	nsultancy ind	Remarks: bgs = below ground surface btoc = below top of casing Air Knife to 8.5' bgs. Groundwater encountered at 7.0' bg Water level at development was 12. No odor or staining observed. Groundwater elevation measured o RCADIS_Analytical Boring-Well 2013 New Logo	is during drill 19' btoc. n November :	ing. 30, 2	2015 was 580.14 feet Page: 1 of 2

Dat Dat Dril Dril Dril San Rig Wat	e Star e Fini ling C ler's I ling M npling Type ter Le ter Le	rt: 10/ ish: 1 Compa Name Metho g Metho g Metho : Soni evel St evel Fi	21/15 0/21/15 any: M : Dan d: Air nod: ( c c cart (ft. nish (f	5 Mateco Moure Knife/S Continu <b>bgs.)</b> <b>t. btoo</b>	Drillin er Sonic Jous : 7.0 <b>c.):</b> 12	g 2.19		Northing: 647436.97 Easting: 12622626.85 Casing Elevation: 592.23 Borehole Depth (ft. bgs.): 45.0 Surface Elevation: 589.5 Descriptions By: A. Westhuis	Well/Boring ID: BCC MW-15020 Client: Consumers Energy Location: BC Cobb Facility 151 N Causeway St. Muskegon, MI Weather Conditions: 60 F Partly Cloudy		
DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description		Water Level (ft. bgs.)	Well/Boring Construction
- 25 	- 565 - - - - 560 -	3	20.0- 30.0'	5.0	NA						
- 35	- - - - - - - - - - - - - - - - - - -	4	30.0- 40.0'	10.0	NA	-		<ul> <li>(31.0 - 32.5') CLAY and SILT, medium plasticity, no dilatancy; trace subround; moist; medium stiff; dark brown (10YR 3/3). NOTE: trace fragments.</li> <li>(32.5 - 34.0') SAND, fine, subround; some to little silt; well sorted; w 5/3).</li> <li>(34.0 - 35.0') CLAY and SILT, low plasticity to non-plastic; some fine subround; wet; soft to very soft; brown (10YR 4/3).</li> <li>(35.0 - 40.0') SAND, fine, subround; trace silt; well sorted; wet; light NOTE: large cobble at 35.0' bgs.</li> </ul>	fine sand, e white shell et; brown (10YR e sand, gray (10YR 7/2).		Bentonite Pellets (32.5- 34.5' bgs) Sand Pack K&E WP1 (34.5- 45.0' bgs) 2" PVC 10 Slot Well Screen (35.0-40.0' bgs)
- 40 - - - -		5	40.0- 45.0'	4.0	NA			(40.0 - 45.0') CLAY, high plasticity, no dilatancy; trace silt; moist; me soft; gray (10YR 5/1). End of boring 45.0' bgs.	edium stiff to		
	540 -		CA	DIS	S Des for buil	ign & Co natural a It assets	nsultancy	Remarks: bgs = below ground surface btoc = below top of casing Air Knife to 8.5' bgs. Groundwater encountered at 7.0' by Water level at development was 12 No odor or staining observed. Groundwater elevation measured of	gs during drilli .19' btoc. n November 3	ng.	2015 was 580.14 feet

Data File: BCC-MW-15020.dat

Dat Dat Dril Dril Sar Rig Wa Wa	e Sta e Fini lling C ller's I lling M npling Type ter Le ter Le	rt: 10/ ish: 10 Compa Name Metho g Metho g Metho : Soni evel St evel Fi	21/15 0/21/15 any: M : Dan d: Air nod: ( c c cart (ft. nish (f	5 Mateco Moure Knife/S Continu bgs.) ft. btoo	Drillin er Sonic Jous : 5.0 c.): 14	ıg 4.00		Northing: 646654.84 Easting: 12623310.03 Casing Elevation: 593.73 Borehole Depth (ft. bgs.): 50.0 Surface Elevation: 590.7 Descriptions By: A. Westhuis	Well/Boring ID: BCC MW-15021 Client: Consumers Energy Location: BC Cobb Facility 151 N Causeway St. Muskegon, MI Weather Conditions: 60 F Partly Cloudy		
DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description		Water Level (ft. bgs.)	Well/Boring Construction
-	-										TOC Elevation = 593.73 (ft. above msl)
- 0 - - - - - - - -	590 - - - - 585 - - - -	1	0.0- 10.0'	5.5	NA		× × × × × × × × × × × × × × × × × × ×	(0.0 - 20.5') ASH, trace fine sand, subround; non-plastic, rapid dilatan moist to wet; very soft; dark gray (10YR 4/1). NOTE: Fill material.	cy; well sorted;		Concrete (0.0- 1.0' bgs)
- 10 - - - - - - - - -		2	10.0-20.0'	10.0	NA	-	* * * * * * * * * * * * * * * * * * * *				2" PVC Well Casing (-3.0- 39.5' bgs)
- 20	570 - - - -						×	<ul> <li>(20.5 - 22.0') SANd, fine, subround; some silt; trace granules, subrour sorted; wet; gray (10YR 5/1) to pale brown (10YR 6/3).</li> <li>(21.5 - 22.0') NOTE: Organic rich matter, wood, sticks, leaves; dark ye (10YR 3/6) from 21.5 to 22.0' bgs.</li> <li>(22.0 - 23.5') SAND, fine, subround; some silt; poorly sorted; wet; gray (10YR 5/2). NOTE: Some organic rich debris, wood and sticks; dark 3/3).</li> </ul>	d; poorly ellowish brown rish brown brown (10YR		A         A         Sentonite/Cemem           A         Grout (1.0-         36.5' bgs)           A         A         A           A         A         A           A         A         A           A         A         A           A         A         A           A         A         A           A         A         A           A         A         A           A         A         A           A         A         A           A         A         A           A         A         A           A         A         A           A         A         A           A         A         A           A         A         A           A         A         A
Proje	Remarks: bgs = below ground surface         Air Knife to 8.0' bgs.         Groundwater encountered at 5.0' bgs during drilling.         Water level at development was 14.00' btoc.         No odor or staining observed.         Groundwater elevation measured on November 30, 2015 was 580.1 feet         above mean sea level.										

Dat Dat Dril Dril Dril San Rig Wat	e Sta e Fini ling C ler's I ling M npling Type ter Le ter Le	rt: 10/ ish: 1 Compa Name Metho g Metho g Metho : Soni evel St evel Fi	21/15 0/21/15 any: M : Dan d: Air nod: ( c c art (ft. nish (f	5 Mateco Moure Knife/S Continu bgs.) t. btoo	Drillin er Sonic Jous : 5.0 <b>:.):</b> 14	g 4.00		Northing: 646654.84 Easting: 12623310.03 Casing Elevation: 593.73 Borehole Depth (ft. bgs.): 50.0 Surface Elevation: 590.7 Descriptions By: A. Westhuis	Well/Boring Client: Cor Location: E	g ID: nsum BC C 151 N Musk ondif	BCC MW-15021 ers Energy obb Facility I Causeway St. egon, MI tions: 60 F Partly Cloudy
DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description		Water Level (ft. bgs.)	Well/Boring Construction
	565 -	3	20.0- 30.0'	10.0	NA			<ul> <li>(23.5 - 25.0') SAND, fine, subround; little silt; well sorted; wet; light (25.0 - 27.0') SAND, fine, subround, and SILT; poorly sorted; moist (10YR 4/3) to dark gray (10YR 4/1). NOTE: some organic debris, s leaves.</li> <li>(27.0 - 28.5') SAND, fine, subround; little to some silt; well sorted; w (10YR 7/2).</li> <li>(28.5 - 29.5') CLAY and SILT, non-plastic, no dilatancy; little fine sa medium stiff; moist; dark brown (10YR 3/3). NOTE: some organic.</li> </ul>	gray (10YR 7/2). / to wet; brown sticks, wood, et; light gray nd, subround; debris, wood		
- 30 - - - 35 - -	560 - - - 555 - - - -	4	30.0- 40.0'	10.0	NA			<ul> <li>(29.5 - 32.5') SAND, fine, subround, and SILT; poorly sorted; moist; (10YR 3/3). NOTE: wood, sticks and leaves from 29.5 to 30.0' and bgs.</li> <li>(32.5 - 35.0') SAND, fine, subround; little silt; well sorted; wet; pale I 6/3).</li> <li>(34.5 - 35.0') NOTE: Organics, wood, sticks.</li> <li>(35.0 - 39.5') CLAY, medium to high plasticity, no dilatancy; little to smedium stiff; very dark brown (10YR 2/2).</li> <li>NOTE: White shell fragments at 37.5' and 38.0' bgs.</li> </ul>	dark brown 32.0 to 32.5' prown (10YR		A     A
- 40 - - - - - - - - - -	550 - - - - - - - - - - - - - - - - - - -	5	40.0- 50.0'	10.0	NA			(42.5 - 50.0') CLAY, high plasticity, no dilatancy; trace silt; moist; me (10YR 5/1).	edium stiff; gray		Sand Pack K&E WP1 (38.5- 50.0' bgs) 2" PVC 10 Slot Well Screen (39.5-42.5' bgs)
	- - -			DIS	S Des	ign & Co natural a It assets	insultancy and	Remarks: bgs = below ground surface Air Knife to 8.0' bgs. Groundwater encountered at 5.0' b Water level at development was 14 No odor or staining observed. Groundwater elevation measured o above mean sea level.	gs during drillir .00' btoc. n November 3	ng.	)15 was 580.1 feet

Data File: BCC-MW-15021.dat

Dat Dat Dril Dril Sar Rig Wa Wa	e Star e Fini lling C ller's I lling M npling Type ter Le ter Le	rt: 10/ ish: 10 Compa Name: Methoo g Meth : Soni evel St evel St	23/15 0/23/15 any: M : Dan d: Air nod: ( c c c art (ft. nish (f	5 Mateco Moure Knife/S Continu <b>bgs.)</b> ft. btoo	Drillin er Sonic Jous : 7.0 <b>c.):</b> 12	g 2.28		Northing: 646263.16 Easting: 12623634.96 Casing Elevation: 595.82 Borehole Depth (ft. bgs.): 45.0 Surface Elevation: 592.6 Descriptions By: A. Westhuis	Well/Boring ID: BCC MW-15022 Client: Consumers Energy Location: BC Cobb Facility 151 N Causeway St. Muskegon, MI Weather Conditions: 40 F Sunny		
DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description		Water Level (ft. bgs.)	Well/Boring Construction
-	-										TOC Elevation = 595.82 (ft. above msl)
	595 - - - - - - - - - - - - - - - -	1	0.0- 10.0'	4.5	NA		* * * * * * * * * * * * * * * * * * * *	(0.0 - 22.0') ASH, trace fine sand, subround; non-plastic, rapid dilatar moist to wet; gray (10YR 5/1). NOTE: Fill material. NOTE: Wet at 7.0' bgs.	ncy; well sorted;		Concrete (0.0- 1.0' bgs)
- 15	585 - - - - 580 - - - - - -	2	10.0-20.0'	9.0	NA		× × × × × × × × × × × × × × × × × × ×				A         2" PVC Well           Casing (-3.0-         24.0' bgs)           Bentonite/Cemem         Grout (1.0-           A         A
-	575 - - -	AR(	CA	DIS	5 Des for buil	iign & Con natural a lt assets	× × ×	(22.0 - 30.0') SAND, fine, subround; trace silt; well sorted; wet; light the (10YR 6/2). <b>Remarks:</b> bgs = below ground surface btoc = below top of casing Air Knife to 9.0' bgs. Groundwater encountered at 7.0' bg Water level at development was 12. No odor or staining observed. Groundwater elevation measured of	orownish gray Is during drilli 28' btoc.	ing.	2015 was 583 42 feet

Dat Dat Drii Drii Sar Rig Wa Wa	te Star te Fini Iling C Iler's I Iling M mpling Type ter Le ter Le	rt: 10/ ish: 10 Compa Name Methor g Methor g Methor s Soni s vel St evel Fi	23/15 0/23/1{ any: M : Dan d: Air nod: ( c c cart (ft. nish (f	5 Mateco Moure Knife/S Continu <b>bgs.)</b> ft. btoo	Drillin er Sonic uous : 7.0 c.): 12	g 2.28		Northing: 646263.16 Easting: 12623634.96 Casing Elevation: 595.82 Borehole Depth (ft. bgs.): 45.0 Surface Elevation: 592.6 Descriptions By: A. Westhuis	Well/Boring ID: BCC MW-15022 Client: Consumers Energy Location: BC Cobb Facility 151 N Causeway St. Muskegon, MI Weather Conditions: 40 F Sunny		
DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description		Water Level (ft. bgs.)	Well/Boring Construction
- - 25 - -	- 570 - - -	3	20.0- 30.0'	8.0	NA						Sand Pack K&E WP1 (23.0- 45.0' bgs) 2" PVC 10 Slot Well Screen (24.0-30.0' bgs)
- 30 - - - - 35 - -	565	4	30.0- 40.0'	9.0	NA			<ul> <li>(30.0 - 33.0') SAND, fine, subround, and SILT, non-plastic, no dilata dilatancy; moist to wet; poorly sorted; light brownish gray (10YR 6/2 brown (10YR 5/2). NOTE: little to some organic debris.</li> <li>(33.0 - 37.0') SILT, non-plastic, no dilatancy; some fine sand, subroi poorly sorted; moist to wet; grayish brown (10YR 5/2) to dark brown NOTE: Organic rich debris, sitcks and wood from 36.0 to 37.0' bgs.</li> <li>(37.0 - 40.5') SAND, fine, subround; little silt; well sorted; wet; light to (10YR 6/2).</li> </ul>	ncy to slow ) to grayish und; little clay; (10YR 3/3).		
- 40 - - - - - -	555 - - - - - - - - - - - - - - - - - -	5	40.0- 45.0'	5.0	NA			(40.5 - 43.0') CLAY and SILT, non-plastic, no dilatancy; some to littl subround; poorly sorted; moist; dark brown (10YR 3/3). NOTE: wh fragments at 41.0' bgs; organic rich. (43.0 - 44.0') SAND, fine, subround; well sorted; light grayish brown (44.0 - 45.0') CLAY and SILT, non-plastic to low plasticity, no dilatar fine sand, subround; moist; dark gray (10YR 3/3). End of boring 45.0' bgs.	e fine sand, ite shell (10YR 6/2). hcy; little to trace		
	- -		CA	DIS	S Dee for bui	s <mark>ign &amp; Co</mark> n natural a lt assets	nsultancy	Remarks: bgs = below ground surface btoc = below top of casing Air Knife to 9.0' bgs. Groundwater encountered at 7.0' b Water level at development was 12 No odor or staining observed. Groundwater elevation measured of	gs during drillir .28' btoc. n November 3	ng. 0, 2	015 was 583.42 feet

Dat Dat Dril Dril Dril Sar Rig Wat	e Star e Fini ling C ler's I ling N npling Type ter Le	rt: 10/ ish: 10 Compa Name: Methoo g Methor s Soni- svel St svel St	23/15 D/23/15 any: M : Dan d: Har nod: ( c c art (ft. nish (f	Mateco Moure ad Aug Continu bgs.):	Drillin er Jous 0.0 2.): 3.	g nic .81		Northing: 647125.15 Easting: 12622999.24 Casing Elevation: 588.08 Borehole Depth (ft. bgs.): 20.0 Surface Elevation: 585.4 Descriptions By: A. Westhuis	Well/Boring Client: Cor Location: E	g II nsur BC 151 Mus onc	D: BCC MW-15023 mers Energy Cobb Facility N Causeway St. skegon, MI ditions: 55 F Cloudy		
DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description		Mater Level (ft. bgs.) Construction			
-	-										TOC Elevation = 588.08 (ft. above msl)		
	585 - - - - 580 - - - - - -	1	0.0- 10.0'	10.0	NA		× × × × × × × × × × × × × × × × × × ×	(0.0 - 10.0') ASH, non-plastic, rapid dilatancy; well sorted; wet; dark NOTE: Fill material. Wet at 0.0' bgs. NOTE: Organic debris, leaves, sticks; dark brown (10YR 2/2) from 9 slight odor.	gray (10YR 4/1).		Concrete (0.0- 1.0' bgs)		
- 10 - - - - - - - - - - - - - - - - - - -	575	2	10.0-20.0'	10.0	NA			<ul> <li>(10.0 - 13.0') SAND, fine to medium, subround; trace silt; well sorted brown (10YR 6/3).</li> <li>(13.0 - 16.0') SAND, very fine to fine, subround; some to little silt; we gayish brown (10YR 5/2).</li> <li>(16.0 - 19.5') SAND, fine, subround; little to trace silt; well sorted; we (10YR 6/3).</li> <li>(19.5 - 20.0') SILT, some clay, non-plastic, no dilatancy; some to little silt subround; poorly sorted; wet; dark brown (10YR 3/3). NOTE: little of wood.</li> <li>End of boring 20.0' bgs.</li> </ul>	; wet; pale Il sorted; wet; t; pale brown e fine sand, rganic debris,	-	Sand Pack K&E WP1 (11.0- 20.0' bgs) 2" PVC 10 Slot Well Screen (12.0-19.5' bgs)		
Prois	-	\R(		DIS	S bes	s <mark>ign &amp; Co</mark> natural a It assets	nsultancy nd	Remarks: bgs = below ground surface btoc = below top of casing Hand Auger to 7.0' bgs. Groundwater encountered at 0.0' bg Water level at development was 3.6 No staining observed. Groundwater elevation measured o	gs during drillir 1' btoc. n November 3	ng. 30, 2	2015 was 584.06 feet Page: 1 of 1		

Data File: BCC-MW-15023.dat Date: 2/8/2016 Created/Edited by: C. Jeffers

# SOIL DESCRIPTION

Udden-Wenworth Scale Modified ARCADIS, 2008								
Size Class	Millimeters	Inches	Standard Sieve #					
Boulder	256 - 4096	10.08+						
Large cobble	128 - 256	5.04 -10.08						
Small cobble	64 - 128	2.52 - 5.04						
Very large pebble	32 - 64	0.16 - 2.52						
Large pebble	16 – 32	0.63 - 1.26						
Medium pebble	8 – 16	0.31 - 0.63						
Small pebble	4 – 8	0.16 - 0.31	No. 5 +					
Granule	2-4	0.08 - 0.16	No.5 – No.10					
Very coarse sand	1-2	0.04 - 0.08	No.10 – No.18					
Coarse sand	1⁄2 - 1	0.02 - 0.04	No.18 - No.35					
Medium sand	1/4 - 1/2	0.01 - 0.02	No.35 - No.60					
Fine sand	1/8 -1⁄4	0.005 - 0.1	No.60 - No.120					
Very fine sand	1/16 – 1/8	0.002 - 0.005	No. 120 – No. 230					
Silt (subgroups not included)	1/256 – 1/16	0.0002 - 0.002	Not applicable (analyze by pipette or hydrometer)					
Clay (subgroups not included	1/2048 - 1/256	.00002 - 0.0002						

Modifier	Percent of Total Sample (by volume)
and	36 - 50
some	21 - 35
little	10 - 20
trace	<10

Description	Criteria
Nonplastic	A <sup>1</sup> / <sub>8</sub> inch (3 mm) thread cannot be rolled at any water content.
Low	The thread can barely be rolled and the lump cannot be formed when drier than the plastic limit.
High	The thread is easy to roll and not much time is required to reach the plastic limit. The thread cannot be rerolled after reaching the plastic limit. The lump crumbles when drier than the plastic limit.
-	It takes considerable time rolling and kneading to reach the plastic limit. The thread can be rolled several times after reaching the plastic limit. The lump can be formed without crumbling when drier than the plastic limit

Description	Criteria
Dry	Absence of moisture, dry to touch, dusty.
Moist	Damp but no visible water.
Wet (Saturated)	Visible free water, soil is usually below the water table.

#### Fine-grained soil - Consistency

Description	Criteria					
Very soft	N-value < 2 or easily penetrated several inches by thumb.					
Soft	N-value 2-4 or easily penetrated one inch by thumb.					
Medium stiff	N-value 9-15 or indented about 1/4 inch by thumb with great effort.					
Very stiff	N-value 16-30 or readily indented by thumb nail.					
Hard						
	N-value > than 30 or indented by thumbnail with difficulty					

#### Coarse-grained soil - Density

Description	Criteria				
Very loose	N-value 1- 4				
Loose	N-value 5-10				
Medium dense	N-value 11-30				
Dense	N-value 31- 50				
Very dense	N-value >50				

Description	Criteria
Angular	Particles have sharp edges and relatively plane sides with unpolished surfaces.
Subangular	Particles are similar to angular description but have rounded edges.
Subrounded	
Rounded	Particles have nearly plane sides but have well-rounded corners and edges.
	Particles have smoothly curved sides and no edges.



## WELL CONSTRUCTION LOG

### WELL NO. BCC-MW-17001

													Page 1 of 1	
Facilit	y/Projec	ct Name	e:				Date Drilling Sta	arted:	Date D	rilling	Complet	ed:	Project Num	iber:
CEC: BC Cobb					12/6/	7	<u> </u>	12/6	5/17 		269767.0000.00			
Drilling Firm: Drilling Method:						Surface Elev. (f		Elevation	i (ft)	i otal E	nole Dia. (in)			
Stearns Sonic 586.1								589.29		D-::#'	20.0		6	
Boring	Logged By - T. Hess										Drilling	⊏quip	oment:	
N: 64	46228.0	) E:	12622	452.1			Driller - B. Mar	shal				Geo	oprobe 814	IO LS
Civil T	own/Ci	ty/or Vil	lage:	County:		State:	Water Level Ob While Drilling	Water Level Observations: While Drilling: Date/Time					7 Depth (ft h	as) 10.0
	Musk	egon		Muskegon		MI	After Drilling:	Da	te/Time	12/7/17 11:35			Depth (ft b	gs) <u>5.81</u>
SAM	1PLE													
NUMBER AND TYPE	RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET			LITHOLOG DESCRIPT	GIC ION			NSCS	GRAPHIC LOG	WELL DIAGRAM	COM	MENTS
				SANDY	COAL AS	H mostly coal ash	some fine to me	dium					1	
1 HA	100		- 2 - 4 - - -	sand, da Change	to some v	10YR 4/1), loose, d woody material at 5	ry. 5.0 feet.							
2 CS	100		6 - 8 - - 10	SILTY S silt and a (10YR 6	<b>AND WIT</b> ash, few t /2), loose	<b>H ASH</b> mostly fine o little woody mate , moist.	to medium sand rial, light brownis	some h gray		SM				
			-	Change	to satura	ted at 10.0 feet.	light brownich gr	NY (10X	P					
3 CS			12— - -	6/2), loo	se, moist		iigint browniish gla	ay (101)		SP			· · ·	
	100			<b>PEAT</b> d saturate	ark organ d.	ic woody material (	10YR 2/1), brittle	<del>)</del> ,						
				<b>SAND</b> mostly fine to medium sand, light brownish gray (10YR 6/2), loose, saturated.					R	SP				
				PEAT d saturate SAND n 6/2), loo	ark organ d. nostly fine se, satura	ic woody material ( to medium sand, ated.	10YR 2/1), brittle light brownish gra	e, ay (10Y	R	SP			· · · ·	
		End of boring at 20.0 feet below ground surface.										<u>.     .</u>		
		~			,									
Signat	ture:	For	<b>u</b> Tanner H	ess	1 mm	Firm: T	RC Environment 540 Eisenhower	al Corp Place /	oration Ann Arb	or, N	11 481	08	(734) Fax (734)	971-7080 971-9022

0710

#### FRC WELL CONSTRUCTION DIAGRAM PROJ. NAME: CEC: BC Cobb WELL ID: BCC-MW-17001 269767.0000 DATE INSTALLED: 12/6/2017 INSTALLED BY: PROJ. NO: CHECKED BY: CS Tanner Hess **CASING AND SCREEN DETAILS** ELEVATION DEPTH BELOW OR ABOVE GROUND SURFACE (FEET) (BENCHMARK: USGS) TYPE OF RISER: 2-INCH PVC PIPE SCHEDULE: 40 589.29 3.1 TOP OF CASING PIPE JOINTS: THREADED O-RINGS SCREEN TYPE: 2-INCH PVC 586.1 0.0 GROUND SURFACE SCR. SLOT SIZE: 0.01-INCH 1.0 CEMENT SURFACE PLUG <u>6</u> IN. FROM <u>0</u> TO <u>20</u> FT. BOREHOLE DIAMETER: IN. FROM TO FT. GROUT/BACKFILL MATERIAL **RISER PIPE LENGTH** IN. FROM TO FT. BENTONITE SLURRY SURF. CASING DIAMETER: -GROUT/BACKFILL METHOD 18.1 TREMIE WELL DEVELOPMENT 11.0 GROUT DEVELOPMENT METHOD: SURGE AND PUMP TIME DEVELOPING: 0.5 HOURS BENTONITE SEAL MATERIAL WATER REMOVED: 9.5 GALLONS MEDIUM CHIPS 13.0 BENTONITE SEAL WATER ADDED: 0 GALLONS WATER CLARITY BEFORE / AFTER DEVELOPMENT 571.1 15.0 TOP OF SCREEN CLARITY BEFORE: **CLOUDY** SCREEN LENGTH FILTER PACK MATERIAL COLOR BEFORE: BROWN 5.00 MEDIUM, WASHED SAND CLARITY AFTER: CLEAR COLOR AFTER: CLEAR 566.1 20.0 BOTTOM OF SCREEN ODOR (IF PRESENT): NONE 20.0 BOTTOM OF FILTER PACK WATER LEVEL SUMMARY MEASUREMENT (FEET) DATE TIME NA BENTONITE PLUG DTB BEFORE DEVELOPING: 23.36 T/PVC 12/6/2017 1653 DTB AFTER DEVELOPING: T/PVC 12/6/2017 23.36 1727 BACKFILL MATERIAL SWL BEFORE DEVELOPING: 8.99 T/PVC 12/6/2017 1653 NA SWL AFTER DEVELOPING: T/PVC 12/6/2017 9.59 1727 OTHER SWL: T/PVC 12/7/2017 1135 8.91 566.1 20.0 HOLE BOTTOM OTHER SWL: T/PVC NOTES: **PROTECTIVE CASING DETAILS** PERMANENT, LEGIBLE WELL LABEL ADDED? ✓ YES NO PROTECTIVE COVER AND LOCK INSTALLED? VES NO LOCK KEY NUMBER: Consumers


											Page 1 d	of 1
Facility	//Projec	t Name	e:		- 6	Date Drilling Started	1:	Date Drillin		ted:	Project N	Number:
Drilling	- Eirm:			CEC: BC Col	DD Method:	12/6/17	TOC	12	/6/17	Donth (	26976	57.0000.000
Dulling	riim:	Cto-	arne		s metrioù.			Elevation (π)	rotal		n bys)   E	orenole Dia. (IN)
Boring	Locativ			Itheast of BCC-MW/ 1F	50117	585.8 Personnel		000.19	Drillin	19.0 n Fauir	ment:	Ю
N: 64	6348.8	B E:	12622	087.2		Logged By - T. He Driller - B. Marshal	SS			Gec	probe 8	3140 LS
Civil T	own/Cit	y/or Vil	lage:	County:	State:	Water Level Observ	ations:	/Time 10/	2/17 00:0	0 5	Donth (	(# has) 10.0
	Musk	egon		Muskegon	MI	After Drilling:	Date	/Time <u>12/</u> /Time <u>12/</u>	7/17 11:2	<u>∪</u> ⊻ <u>8</u> ⊻ □	Depth ( Depth (	ft bgs) <u>10.0</u>
SAM	PLE											
NUMBER AND TYPE	RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET		LITHOLOG DESCRIPT	BIC ION		NSCS	GRAPHIC LOG	WELL DIAGRAM	СС	MMENTS
				SANDY COAL	ASH mostly coal ash,	, some fine to mediu	Im				1	
1 HA	100		- 2- - - 4	sand, trace gr	avel, dark gray (10YR	4/1), loose, dry.						
2 CS	100		-   8 	COAL ASH m	nostly coal ash, dark gr	ay (10YR 4/1), loose	e, dry.					
			- 10-	coal ash, dark	gray (10YR 4/1), loose fine to medium sand,	e, dry. light brownish gray (	(10YR	SP				
3 CS	100		- - - - - 14 - - - -	6/2), loose, sa	aturated.			SP				
			16 — - - 18 —	PEAT mostly	organic material, some	e silt and woody ma	erial,				- - -	
			-	black (10YR 2 End of boring	2/1), saturated. at 19.0 feet below grou	und surface.			<u>1/ \\ 1/</u>		-	
			-		-							
Signat	ure:	<b>Sa</b> For 7	<b>eac</b> Fanner H	<b>S. Helenste</b> less	Firm: T	RC Environmental ( 540 Eisenhower Pla	Corpo Ice A	ration nn Arbor,	MI 481	08	(73 Fax (73	34) 971-708( 34) 971-9022

### FRC WELL CONSTRUCTION DIAGRAM PROJ. NAME: WELL ID: BCC-MW-17002 CEC: BC Cobb 269767.0000 DATE INSTALLED: 12/6/2017 INSTALLED BY: PROJ. NO: CHECKED BY: CS Tanner Hess **CASING AND SCREEN DETAILS** ELEVATION DEPTH BELOW OR ABOVE GROUND SURFACE (FEET) (BENCHMARK: USGS) TYPE OF RISER: 2-INCH PVC PIPE SCHEDULE: 40 588.79 3.0 TOP OF CASING PIPE JOINTS: THREADED O-RINGS SCREEN TYPE: 2-INCH PVC 585.8 0.0 GROUND SURFACE SCR. SLOT SIZE: 0.01-INCH 1.0 CEMENT SURFACE PLUG <u>6</u> IN. FROM <u>0</u> TO <u>18</u> FT. BOREHOLE DIAMETER: IN. FROM TO FT. GROUT/BACKFILL MATERIAL *RISER PIPE LENGTH* IN. FROM TO FT. IN. FROM TO FT. BENTONITE SLURRY SURF. CASING DIAMETER: -GROUT/BACKFILL METHOD 16.5 TREMIE WELL DEVELOPMENT 9.0 GROUT DEVELOPMENT METHOD: SURGE AND PUMP TIME DEVELOPING: 0.5 HOURS BENTONITE SEAL MATERIAL WATER REMOVED: 9.5 GALLONS MEDIUM CHIPS 0 GALLONS 11.0 BENTONITE SEAL WATER ADDED: WATER CLARITY BEFORE / AFTER DEVELOPMENT 572.3 13.5 TOP OF SCREEN CLARITY BEFORE: **CLOUDY** SCREEN LENGTH FILTER PACK MATERIAL COLOR BEFORE: LIGHT BROWN 5.00 MEDIUM, WASHED SAND CLARITY AFTER: CLEAR COLOR AFTER: CLEAR 567.3 18.5 BOTTOM OF SCREEN ODOR (IF PRESENT): SLIGHT SULFUR 18.5 BOTTOM OF FILTER PACK WATER LEVEL SUMMARY MEASUREMENT (FEET) DATE TIME NA BENTONITE PLUG DTB BEFORE DEVELOPING: 21.49 T/PVC 12/6/2017 1533 DTB AFTER DEVELOPING: 21.49 T/PVC 12/6/2017 1615 BACKFILL MATERIAL SWL BEFORE DEVELOPING: 8.49 T/PVC 12/6/2017 1533 NATURAL COLLAPSE SWL AFTER DEVELOPING: T/PVC 12/6/2017 8.58 1615 OTHER SWL: T/PVC 12/7/2017 1128 8.43 566.8 19.0 HOLE BOTTOM OTHER SWL: T/PVC NOTES: **PROTECTIVE CASING DETAILS** PERMANENT, LEGIBLE WELL LABEL ADDED? ✓ YES NO PROTECTIVE COVER AND LOCK INSTALLED? VES NO LOCK KEY NUMBER: Consumers



												Page 1 of	1
Facility/Project	ct Name:					Date Drilling Started:		Date D	rilling	Comple	ted:	Project Nu	mber:
Drilling Firm		CEC: B	C Cobb	- d.		12/5/17			12/	5/17	Donth (	269767	.0000.000
Drilling Firm:	Stoorpo		Drilling weth	Sonio			TUCE		(π)	Total I		π bgs)   Bor	enole Dia. (in)
Boring Locati	Stearns	northeast of BC	C-MW-15018	Sonic		209.3 Personnel	0	92.37		Drilling		ment <sup>.</sup>	0
N: 646794.9	) E: 1262	2184.8	0 100 10.			Logged By - T. Hess Driller - B. Marshal	6			Drinnių	Geo	probe 81	40 LS
Civil Town/Cit	ty/or Village:	County:		State:		Water Level Observa	tions:	Time	10/5/	17 00.0	<b>)</b> \[\[\]	Dopth (ft.)	hao) 11.0
Musk	egon	Musk	egon	MI		After Drilling:	Date/	Time _	12/3/	<u>17 00.00</u> 17 11:24	<u>,</u> ⊻ 1_ ⊻	Depth (it )	bgs) <u>11.0</u> bgs) <u>9.07</u>
SAMPLE													
NUMBER AND TYPE RECOVERY (%)	BLOW COUNTS DEPTH IN FEET			LITHOLO DESCRIPT	GIC TION				NSCS	GRAPHIC LOG	WELL DIAGRAM	CON	IMENTS
		SANDY	COAL ASH	mostly coal ash	h, som	ne fine to mediur	n					1	
1 HA 100	2	_ sand, tra - - - - - - - -	ace gravel,	brown (10YR 4/S	3), loo	se, dry.							
2 CS 100	8	- - - - - - - - - - - - - - - - -	<b>SH</b> mostly	r coal ash, dark g	gray (1	0YR 4/1), loose,	, dry.						
	10	 Change  	to saturate	ed at 11.0 feet.									
3 CS 100	14	<b>SAND</b> n 6/2), loo	nostly fine se, saturat	to medium sand, ed.	, light	brownish gray (1	IOYR						
	20	-							SP			-	
4 CS 100	22	End of b	ooring at 22	2.0 feet below gro	ound s	surface.						-	
	Sail	5 Abla	ston	•  ·· -	TRA							/=	074
Signature:	For Tanner	Hess		Firm:	1540 I	Environmental C Eisenhower Plac	orpor ce Ar	ation in Arb	or, N	<i>I</i> I 481	08	(734) Fax (734)	) 971-7080 ) 971-9022

### FRC WELL CONSTRUCTION DIAGRAM PROJ. NAME: WELL ID: BCC-MW-17003 CEC: BC Cobb 269767.0000 DATE INSTALLED: 12/6/2017 INSTALLED BY: PROJ. NO: CHECKED BY: CS Tanner Hess **CASING AND SCREEN DETAILS** ELEVATION DEPTH BELOW OR ABOVE GROUND SURFACE (FEET) (BENCHMARK: USGS) TYPE OF RISER: 2-INCH PVC PIPE SCHEDULE: 40 592.37 2.9 TOP OF CASING PIPE JOINTS: THREADED O-RINGS SCREEN TYPE: 2-INCH PVC 589.3 0.0 GROUND SURFACE SCR. SLOT SIZE: 0.01-INCH 1.0 CEMENT SURFACE PLUG <u>6</u> IN. FROM <u>0</u> TO <u>22</u> FT. BOREHOLE DIAMETER: IN. FROM TO FT. GROUT/BACKFILL MATERIAL ISER PIPE LENGTH IN. FROM TO FT. BENTONITE SLURRY SURF. CASING DIAMETER: -GROUT/BACKFILL METHOD 19.9 TREMIE WELL DEVELOPMENT 13.0 GROUT DEVELOPMENT METHOD: SURGE AND PUMP TIME DEVELOPING: 0.5 HOURS BENTONITE SEAL MATERIAL WATER REMOVED: 9.5 GALLONS MEDIUM CHIPS 15.0 BENTONITE SEAL WATER ADDED: 0 GALLONS WATER CLARITY BEFORE / AFTER DEVELOPMENT 572.3 17.0 TOP OF SCREEN CLARITY BEFORE: **CLOUDY** SCREEN LENGTH FILTER PACK MATERIAL COLOR BEFORE: BROWN 5.00 MEDIUM, WASHED SAND CLARITY AFTER: CLEAR COLOR AFTER: CLEAR 567.3 22.0 BOTTOM OF SCREEN ODOR (IF PRESENT): NONE 22.0 BOTTOM OF FILTER PACK WATER LEVEL SUMMARY MEASUREMENT (FEET) DATE TIME NA BENTONITE PLUG DTB BEFORE DEVELOPING: 25.25 T/PVC 12/6/2017 1258 DTB AFTER DEVELOPING: 25.25 T/PVC 12/6/2017 1337 BACKFILL MATERIAL SWL BEFORE DEVELOPING: 12.05 T/PVC 12/6/2017 1258 NA SWL AFTER DEVELOPING: T/PVC 12/6/2017 12.10 1337 OTHER SWL: 11.97 T/PVC 12/7/2017 1124 567.3 22.0 HOLE BOTTOM OTHER SWL: T/PVC NOTES: **PROTECTIVE CASING DETAILS** PERMANENT, LEGIBLE WELL LABEL ADDED? VES NO PROTECTIVE COVER AND LOCK INSTALLED? VES NO LOCK KEY NUMBER: Consumers



														Page 1	of 1	
Facility	//Projec	t Name	e:					Date Drilling Started:		Date Drill	ling (	Complete	ed:	Project	Number:	
D	<b>E</b> !			CEC: B	C Cobb			12/5/17	TOO	1	12/5	5/17		2697	67.000	0.0000
Drilling	Firm:	01			Drilling Meth			Surface Elev. (ft)	TOCE	Elevation (1	π)	I otal L	epth (	(ft bgs)	Borehole I	Dia. (in)
Boring	Locatio			theast of BCC.	M\\/_15010	Sonic		589.1 Personnel	5	91.84		Drilling	ZZ.5	ment.	c	)
N: 64	7110.1	I E:	12622	373.4	10013.			Logged By - T. Hest Driller - B. Marshal	S			Drining	Geo	oprobe	8140 L	S
Civil To	own/Cit	y/or Vil	lage:	County:		State:		Water Level Observa	ations: Date	/Time 1	2/5/1	7 00.00	$\nabla$	7 Denth	(ft bas)	10.0
	Musk	egon		Musk	egon	1	MI	After Drilling:	Date/	/Time <u>1</u>	2/7/1	7 11:20	_ 1	Depth	(ft bgs)	9.03
SAM	PLE															
NUMBER AND TYPE	RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET			LIT DES	HOLOGIC CRIPTION				USCS	GRAPHIC LOG	WELL DIAGRAM	C	OMMEN	NTS
	_	_		SANDY	COAL AS	H mostly c	oal ash, son	ne fine to mediur	m				-	1		
1 HA	100		- 2 - 4 -	sand, tra	ace gravel	, brown (10	9YR 4/3), loc	ose, dry.								0.4- 40.0
2 CS	0		- 6 - - 8 - - - - - - 10	⊂ COAL A ▼ ▽	SH mostly	y coal ash,	dark gray (*	10YR 4/1), loose	- <u></u>					No recov	very from 5.	0 to 10.0
			- - 12— -	Change	to saturat	ed at 10.0 t	sand light	brownish grav (	10YR							
3 CS	100			6/2), loo	se, satura	ted.										
4 CS	80									S	SP					
			22	End of b	oring of O	2 E faat ha	low ground	surface								
			-		oring at 2		iow ground :									
Signati	ure:	<b>Sa</b> For T	<b>u</b> Fanner H	<b>S. Heli</b>	ston		Firm: TRC 1540	Environmental C Eisenhower Plac	Corpor	ration	r. M	481(	08	(7 Fax (7	34) 971 34) 971	-7080
L											, .,		-		,	

### FRC WELL CONSTRUCTION DIAGRAM PROJ. NAME: WELL ID: BCC-MW-17004 CEC: BC Cobb 269767.0000 DATE INSTALLED: 12/5/2017 INSTALLED BY: PROJ. NO: CHECKED BY: CS Tanner Hess **CASING AND SCREEN DETAILS** ELEVATION DEPTH BELOW OR ABOVE GROUND SURFACE (FEET) (BENCHMARK: USGS) TYPE OF RISER: 2-INCH PVC PIPE SCHEDULE: 40 591.84 2.6 TOP OF CASING PIPE JOINTS: THREADED O-RINGS SCREEN TYPE: 2-INCH PVC 589.1 0.0 GROUND SURFACE SCR. SLOT SIZE: 0.01-INCH 1.0 CEMENT SURFACE PLUG <u>6</u> IN. FROM <u>0</u> TO <u>22</u> FT. BOREHOLE DIAMETER: IN. FROM TO FT. GROUT/BACKFILL MATERIAL *RISER PIPE LENGTH* \_\_\_\_IN. FROM\_\_\_\_TO\_\_\_\_FT. \_\_\_IN. FROM\_\_\_\_TO\_\_\_\_FT. BENTONITE SLURRY SURF. CASING DIAMETER: -GROUT/BACKFILL METHOD 20.1 TREMIE WELL DEVELOPMENT 13.0 GROUT DEVELOPMENT METHOD: SURGE AND PUMP TIME DEVELOPING: 0.5 HOURS BENTONITE SEAL MATERIAL WATER REMOVED: 9.5 GALLONS MEDIUM CHIPS 15.0 BENTONITE SEAL WATER ADDED: 0 GALLONS WATER CLARITY BEFORE / AFTER DEVELOPMENT 571.6 17.5 TOP OF SCREEN CLARITY BEFORE: **CLOUDY** SCREEN LENGTH FILTER PACK MATERIAL COLOR BEFORE: BROWN 5.00 MEDIUM, WASHED SAND CLARITY AFTER: CLEAR COLOR AFTER: CLEAR 566.6 22.5 BOTTOM OF SCREEN ODOR (IF PRESENT): NONE 22.5 BOTTOM OF FILTER PACK WATER LEVEL SUMMARY MEASUREMENT (FEET) DATE TIME NA BENTONITE PLUG DTB BEFORE DEVELOPING: 25.27 T/PVC 12/5/2017 1544 DTB AFTER DEVELOPING: 25.27 T/PVC 12/5/2017 1625 BACKFILL MATERIAL SWL BEFORE DEVELOPING: 11.20 T/PVC 12/5/2017 1544 NA SWL AFTER DEVELOPING: T/PVC 12/5/2017 11.30 1625 OTHER SWL: 11.63 T/PVC 12/7/2017 1120 566.6 22.5 HOLE BOTTOM OTHER SWL: T/PVC NOTES: **PROTECTIVE CASING DETAILS** PERMANENT, LEGIBLE WELL LABEL ADDED? VES NO PROTECTIVE COVER AND LOCK INSTALLED? VES NO LOCK KEY NUMBER: Consumers



											Page 1 of	1
Facilit	y/Projec	ct Nam	e:			Date Drilling Started:		Date Drilling	Complet	ed:	Project Nu	imber:
				CEC: BC Cobb		12/4/17		12/	5/17		269767	.0000.0000
Drillin	g Firm:	_		Drilling Meth	od:	Surface Elev. (ft)	TOC E	levation (ft)	Total [	Depth (	ft bgs)   Boi	rehole Dia. (in)
D	-1 · · · · · · · · · · · · · · · · · · ·	Ste	arns		Sonic	589.3	5	92.42	D. III	30.0		6
Boriné	g Locati	on: 8	reet sou	utriwest of BCC-MW-15020.		Logged By - T. Hess	5		Drilling	⊢quip	oment:	
N: 64	47433.9	9 E:	12622	619.7		Driller - B. Marshal				Geo	probe 81	40 LS
Civil 7	Town/Ci	ty/or Vi	llage:	County:	State:	Water Level Observa	tions: Date/	Time 12/4	17 00.00	) 🖓	Depth (ft	bas) 11.5
	Musk	egon		Muskegon	MI	After Drilling:	Date/	Time <u>12/4/</u>	<u>/17 11:17</u>	<u> </u>	Depth (ft	bgs) <u>9.96</u>
SAN	1PLE											
	(%)	١TS	EET		LITHOLOGI	С			g	AM	0.01	
КЦ	ERY	1 D D	IN FI		DESCRIPTIC	NC			CLC	IAGF	CON	
ABEI ) TYI	) OVE	N C	THI					ېر بر	HA	Г Г		
	REC	BLO	DEF						GR∕	WEL		
			-	GRAVEL mostly g	ravel, white (10YR	8/1), road base.		GP	600			
			-	SANDY COAL ASH	H mostly coal ash,	some fine to mediur	n					
			-	sand, trace gravel	, brown (10YR 4/3),	loose, dry.				1 F		
1 HA	100		-									
			-									
			5-						B			
			-									
			-						X			
2	50		-	Change to come to		at 0.0 fact						
00			-	Change to very da	irk gray (10YR 3/1)	al 0.0 ieet.			X			
			10-	<b>▼</b>								
			-						X			
			-	COAL ASH mostly	y coal ash, dark gra	y (10YR 4/1), loose.	,					
			-	saturated.								
			_						Z			
3	100		15-									
CS	100		15						X			
				SAND mostly fine	to medium sand, lig	ght brownish gray (1	10YR					
				0/2, $00se$ , satura	ieu.						]	
			-									
			-								-	
			20-	1				SP		目		
			-							目	]	
			-									
			-	-						目	1	
			-	PEAT mostly orga	nic material, some	silt and woody mate	erial,		<u></u>	目		
4 CS	100		25 —	black (10YR 2/1),	saturated.	,	-		1, 1,	日		
			-	1					111 1			
			-						1, 11			
			-	SAND mostly fine	to medium sand lie	aht brownish arav (1	10YR		1111			
			-	6/2), loose, satura	ted.	gen alla stringer gray (1		SP				
			30	End of boring at 3	0.0 feet below arou	nd surface					-	
Signa	ture:	Se	ul	5. Holmston	- Firm TC	C Environmental C	ornor	ation			(704	) 071, 7090
Jigha		For	Tanner H	less	15	40 Eisenhower Plac	ce Ar	n Arbor. I	MI 481	08	Fax (734	) 971-9022
								,			``	•

### FRC WELL CONSTRUCTION DIAGRAM PROJ. NAME: WELL ID: BCC-MW-17005 CEC: BC Cobb PROJ. NO: 269767.0000 DATE INSTALLED: 12/5/2017 INSTALLED BY: CHECKED BY: CS Tanner Hess **CASING AND SCREEN DETAILS** ELEVATION DEPTH BELOW OR ABOVE GROUND SURFACE (FEET) (BENCHMARK: USGS) TYPE OF RISER: 2-INCH PVC PIPE SCHEDULE: 40 592.42 3.1 TOP OF CASING PIPE JOINTS: THREADED O-RINGS SCREEN TYPE: 2-INCH PVC 589.3 0.0 GROUND SURFACE SCR. SLOT SIZE: 0.01-INCH 1.0 CEMENT SURFACE PLUG <u>6</u> IN. FROM <u>0</u> TO <u>24</u> FT. BOREHOLE DIAMETER: IN. FROM TO FT. GROUT/BACKFILL MATERIAL ISER PIPE LENGTH IN. FROM TO FT. BENTONITE SLURRY SURF. CASING DIAMETER: -GROUT/BACKFILL METHOD 23.1 TREMIE WELL DEVELOPMENT 15.0 GROUT DEVELOPMENT METHOD: SURGE AND PUMP TIME DEVELOPING: 0.5 HOURS BENTONITE SEAL MATERIAL WATER REMOVED: 9.5 GALLONS MEDIUM CHIPS 17.0 BENTONITE SEAL WATER ADDED: 0 GALLONS WATER CLARITY BEFORE / AFTER DEVELOPMENT 569.3 20.0 TOP OF SCREEN CLARITY BEFORE: **CLOUDY** SCREEN LENGTH FILTER PACK MATERIAL COLOR BEFORE: BROWN 5.00 MEDIUM, WASHED SAND CLARITY AFTER: CLEAR COLOR AFTER: CLEAR 564.3 25.0 BOTTOM OF SCREEN ODOR (IF PRESENT): NONE 25.0 BOTTOM OF FILTER PACK WATER LEVEL SUMMARY MEASUREMENT (FEET) DATE TIME NA BENTONITE PLUG DTB BEFORE DEVELOPING: 27.89 T/PVC 12/5/2017 1400 DTB AFTER DEVELOPING: 27.89 T/PVC 12/5/2017 1445 BACKFILL MATERIAL SWL BEFORE DEVELOPING: 12.73 T/PVC 12/5/2017 1400 NATURAL COLLAPSE SWL AFTER DEVELOPING: T/PVC 12/5/2017 12.80 1445 OTHER SWL: 13.06 T/PVC 12/7/2017 1117 559.3 30.0 HOLE BOTTOM OTHER SWL: T/PVC NOTES: **PROTECTIVE CASING DETAILS** PERMANENT, LEGIBLE WELL LABEL ADDED? NO VES PROTECTIVE COVER AND LOCK INSTALLED? VES NO LOCK KEY NUMBER: Consumers



				-							I	Page 1 of	1
Facilit	y/Projec	ct Name	e:				Date Drilling Started:		Date Drilling	Complet	ed:	Project Nu	imber:
				CEC: BC	Cobb		12/4/17	TOO	12/4	12/4/17			2.0000.0000
Drilling	g Firm:	~		Dr	Illing Method:		Surface Elev. (ft)	TOC E	evation (ft)	Total D	epth (f	t bgs)   Bo	rehole Dia. (in)
Porin		Stea	arns		Son	IC	590.5	5	93.78	Drilling	30.0	mont	6
N: 64	16657.7	7 E:	12623	301.3	21.		Personnel Drilling Equipment: Logged By - T. Hess Driller - B. Marshal Geoprobe 81						140 LS
Civil T	own/Cit	ty/or Vil	lage:	County:	State:		Water Level Observa	ations:			_		
	Musk	egon		Muskeg	on	MI	While Drilling: After Drilling:	Date/ Date/	Time <u>12/4/</u> Time <u>12/7/</u>	<u>17 00:00</u> 17 11:11	_ ¥ Į	Depth (ft Depth (ft	bgs) <u>11.5</u> bgs) <u>13.5</u>
SAM	IPLE												
NUMBER AND TYPE	RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET		C	LITHOLOGIC DESCRIPTION			nscs	GRAPHIC LOG	WELL DIAGRAM	CON	MENTS
			-	TOPSOIL COAL ASH loose.	black (10YR 2/ I mostly coal a	1). sh, dark gray (	10YR 4/1), fine, s	soft,					
1 HA	100		- - 5—										
2 CS	100		- -	Change to	moist at 9.0 fe	et.							
3 CS	100		10— - - 15— -	Change to $\overline{\Sigma}$ Change to $\mathbf{\Psi}$	dry at 10.0 fee saturated at 11	t. 1.5 feet.							
			- - 20—										
4	100		- - - 25—	SAND mos 6/2), loose PEAT mos black (10Y SAND mos	stly fine to med , saturated. stly organic ma R 2/1), saturate stly fine to med	ium sand, light terial, some silf ed. ium sand, light	brownish gray (1 and woody mate	10YR erial, 10YR	SP				
CS				6/2), loose <b>PEAT</b> mos black (10Y <b>SAND</b> mos 6/2), loose	, saturated. stly organic mai R 2/1), saturate stly fine to med , saturated.	terial, some sill ed. ium sand, light	and woody mate	erial, 10YR	SP				
				End of bor	ng at 30.0 feet	below ground	surface.						
	I	~	-		,				· · · · ·	· · · · ·	I		
Signat	ture:	Sa	ut.	S. Helms	ton	Firm: TRC	Environmental C	orpor	ation			(734	) 971-7080
		For	Гanner H	ess		1540	Eisenhower Place	ce Ar	nn Arbor, N	<i>I</i> I 481	08	Fax (734	) 971-9022
Check	ed By:	C.	Scieszł	a									

### FRC WELL CONSTRUCTION DIAGRAM PROJ. NAME: WELL ID: BCC-MW-17006 CEC: BC Cobb PROJ. NO: 269767.0000 DATE INSTALLED: 12/4/2017 INSTALLED BY: CHECKED BY: CS Tanner Hess **CASING AND SCREEN DETAILS ELEVATION** DEPTH BELOW OR ABOVE GROUND SURFACE (FEET) (BENCHMARK: USGS) TYPE OF RISER: 2-INCH PVC PIPE SCHEDULE: 40 593.78 3.3 TOP OF CASING PIPE JOINTS: THREADED O-RINGS SCREEN TYPE: 2-INCH PVC 590.5 0.0 GROUND SURFACE SCR. SLOT SIZE: 0.01-INCH 1.0 CEMENT SURFACE PLUG <u>6</u> IN. FROM <u>0</u> TO <u>30</u> FT. BOREHOLE DIAMETER: IN. FROM TO FT. GROUT/BACKFILL MATERIAL ISER PIPE LENGTH IN. FROM TO FT. BENTONITE SLURRY SURF. CASING DIAMETER: -GROUT/BACKFILL METHOD 27.8 TREMIE WELL DEVELOPMENT 20.5 GROUT DEVELOPMENT METHOD: SURGE AND PUMP TIME DEVELOPING: 0.75 HOURS BENTONITE SEAL MATERIAL WATER REMOVED: 14.25 GALLONS MEDIUM CHIPS 0 GALLONS 22.5 BENTONITE SEAL WATER ADDED: WATER CLARITY BEFORE / AFTER DEVELOPMENT 566.0 24.5 TOP OF SCREEN CLARITY BEFORE: **CLOUDY** SCREEN LENGTH FILTER PACK MATERIAL COLOR BEFORE: BROWN 5.00 MEDIUM, WASHED SAND CLARITY AFTER: CLEAR COLOR AFTER: CLEAR 561.0 29.5 BOTTOM OF SCREEN ODOR (IF PRESENT): NONE 29.5 BOTTOM OF FILTER PACK WATER LEVEL SUMMARY MEASUREMENT (FEET) DATE TIME NA BENTONITE PLUG DTB BEFORE DEVELOPING: 32.69 T/PVC 12/5/2017 1153 DTB AFTER DEVELOPING: 32.69 T/PVC 12/5/2017 1315 BACKFILL MATERIAL SWL BEFORE DEVELOPING: 16.60 T/PVC 12/5/2017 1153 NATURAL COLLAPSE SWL AFTER DEVELOPING: T/PVC 12/5/2017 16.90 1315 OTHER SWL: T/PVC 12/7/2017 16.80 1111 560.5 30.0 HOLE BOTTOM OTHER SWL: T/PVC NOTES: **PROTECTIVE CASING DETAILS** PERMANENT, LEGIBLE WELL LABEL ADDED? NO VES PROTECTIVE COVER AND LOCK INSTALLED? VES NO LOCK KEY NUMBER: Consumers



### PROJECT NAME: BC Cobb

SME

CLIENT: HDR Michigan Inc

### PROJECT NUMBER: 083742.02

### PROJECT LOCATION: Muskegon, Michigan

**BORING MW-15015R** 

PAGE 1 OF 1

CLIENT:	CLIENT:       HDR Michigan Inc       PROJECT LOCATION:       Muskegon, Michigan											
DATE STARTED:     5/12/20     COMPLETED:     5/12/20     BORING METHOD:     Hollow-stem Augers												
OPERAT	то	<b>R:</b> B	G (St	earns Drilling) F	RIG NO.: ATV		LOG	GED B	Y: ML	S	CHECKED BY: CES	
ELEVATION (FEET)	DEPTH (FEET)	SYMBOLIC PROFILE	SURF	ACE ELEVATION: 586.8 FT PROFILE DESCI	RIPTION	SAMPLE TYPE/NO. INTERVAL	RECOVERY (inches)	PID (ppm)	SOIL ANAL YTICAL SAMPLE	TEMPORARY WELL SCREEN	REMARKS	
-	-0-		1.0	FILL- Fine to Mediur Dark Brown- Moist (	n SAND with Silt- SP-SM) 585.8	1					9-inch diameter flush mounted protective casing set – in concrete	
- 585 - - - - - 580	5-			FILL- Fine to Mediur Silt from 4 to 4.25 Fe Moist	n Sandy COAL ASH- let- Black and Gray-	LS1	24	<1			Filter Sand	
- ⊻ - 	10 -		8.0	FILL- Fine to Mediur	578.8 n SAND- Some Ash,	LS2	24	<1				
575 - - -	15 -		15.0	Wood Pieces and O Wet (SP)	ganics- Dark Brown-	LS3	15	<1				
- - 570 - -	20 -			Fine to Medium SAN (SP)	D- Dark Gray- Wet	LS4	11	<1				
- - 565 -			23.0	Fine to Medium SAN	563.8 D with Silt- Wood	5						
- <u></u> - - 560 -	25 -		24.5	Pieces- Dark Gray- V Fine to Medium SAN from 28 to 28.5 Feet	Vet (SP-SM)         562.3           D- Wood Pieces         Gray- Wet (SP)	LS5	18	<1				
-			28.5 29.5	Fine to Medium SAN Wet (ML/SM)	558.3 DY SILT- Dark Gray- 557.3	LS6	19	<1				
; 	-30-					1	I	I				
GRC	ng Nd LL N	Borii Of BC	ir & B NG: Dring DD:	ACKFILL INFORMATION DEPTH (FT) ELEV 8.0 578 3: 4.8 582 Well	NOTES: 1. Soil samp of Soils (V associate 2. The indic 3. Listed dep to the repo 4. No odors	les were /isual-Ma d report( ated stra oths und ort and a noted ar	e classif anual P (s) shou tificatio er the p attachm nd no st	fied acc rocedur Ild not b n lines a rofile de ents for aining c	ording to re) for en oe used f are appro- escription actual s observed	o ASTM wironma or geota oximate n are ro ample o	D2488, Standard Practice for Description and Identification ental purposes only. Therefore, the boring logs and echnical evaluation or design. . In situ, the transition between materials may be gradual. unded to the nearest tenth of a foot (e.g. 5.75 = 5.8). Refer depths and/or intervals (where applicable).	

# **BORING MW-15016R**

PAGE 1 OF 2

(Continued Next Page)

PROJECT NAME: BC Cobb

**PROJECT NUMBER:** 083742.02

**SME** 



# **BORING MW-15016R**

PAGE 2 OF 2

### PROJECT NAME: BC Cobb

### PROJECT NUMBER: 083742.02

CLIENT:	HD	R Michi	gan Inc			PROJ	ECT L	OCAT	ION:	: Muskegon, Michigan
ELEVATION (FEET)	SYMBOLIC	SURF	FACE ELEVATION: 586.8 FT PROFILE DESCRIPTION		SAMPLE TYPE/NO. INTERVAL	RECOVERY (inches)	PID (ppm)	SOIL ANALYTICAL SAMPLE		REMARKS
555 - -		33.5 33.5 34.0 35.0	Fine to Medium SAND with Wood Pieces and Organics (SP) <i>(continued)</i> 55           SILTY CLAY- Dark Gray (CL-ML)           55           Fine to Medium SAND- Wood Chunks at           34 Feet- Dark Gray. Wet (SP)	3.3 2.8 1.8	LS7	23	<1			Bentonite Chip Plug
- - 550 -		39.0	Fine to Medium SILTY CLAY with Sand- Gray (CL-ML)	7.8	LS8	20	<1			2-inch diameter PVC with 0.010-inch slot size well
- 4( - -545 -	0		Fine to Medium SAND- Gray Brown- Wet (SP)		LS9	10	<1			screen, 5 feet long
4! - - 540 -	5-77 - - - - -	2224 <u>5.0</u>	54 LEAN CLAY- Gray (CL) -54 END OF BORING AT 45.0 FEET.	2.1 1.8					<u></u>	
- 50 - - 535 -	- 0									
- 55 - 530 - 530	5									
- 6( - - 525	- 0									
- - 65 - 520	5									
- 7(	-									



### **BORING MW-17001R**

### MW-15014R FC PAGE 1 OF 1 CLIENT Muskegon Environmental Redevelopment Group **PROJECT NAME** Former BC Cobb Power Plant PROJECT NUMBER 10220433 PROJECT LOCATION Muskegon, MI GROUND ELEVATION \_586.9 ft MSL HOLE DIAMETER \_8 DATE STARTED 01/31/22 10:15 COMPLETED 01/31/22 12:15 DRILLING CONTRACTOR Stearn SRILLER Gary Greerlings **GROUND WATER LEVELS:** DRILLING METHOD HSA EQUIPMENT CME 55 ☑ AT TIME OF DRILLING 15.00 ft / Elev 571.90 ft LOGGED BY \_\_\_\_\_ Tanten Buszka \_\_\_\_ CHECKED BY \_\_\_\_\_ **20 HRS AFTER DRILLING** <u>13.69 ft / Elev 573.21 ft</u> NOTES ER ER Т

Image: Sign of the second s	EPT (∰	(ft) APLE JUMB		LOG LOG		MATERIAL DESCRIPTION	WELL DIAGRAM
0       Celling Type: 2' SCH 40 PVC         0       8         0       8         5       8         1       8         5       8         10       8         8       5         10       8         8       5         10       8         10       8         10       8         10       8         10       8         10       8         10       8         10       8         10       8         10       8         10       8         10       8         10       8         10       8         10       8         10       8         10       8         10       8         10       8         10       13.5         10       13.5         10       13.5         10       13.5         10       13.5         10       13.5         10       13.5         10       13.5				5			Casing Top Elev: 589.7 (ft)
-       6       poorly graded, subrounded, fine to medium grained, moist, dense, iron oxide         -       -       -       -         -       -       -       -         -       -       -       -         -       -       -       -         -       -       -       -         -       -       -       -         -       -       -       -         -       -       -       -         -       -       -       -         -       -       -       -         -       -       -       -       -         -       -       -       -       -         -       -       -       -       -         -       -       -       -       -         -       -       -       -       -       -         -       -       -       -       -       -         -       -       -       -       -       -         -       -       -       -       -       -       -         -       -       -       -       - <t< th=""><th>0</th><th></th><th></th><th></th><th></th><th>POORLY GRADED SAND WITH SILT AND GRAVEL (SP) brown (10YR 6/6)</th><th>Casing Type: 2" SCH 40 PVC</th></t<>	0					POORLY GRADED SAND WITH SILT AND GRAVEL (SP) brown (10YR 6/6)	Casing Type: 2" SCH 40 PVC
addition of the second second of the seco		Å	S			poorly graded, subrounded, fine to medium grained, moist, dense, iron oxide	Cement Seal
5       7       8.5       SILT WITH SAND. (ML) gray (10YR 5/1), poorly graded, fine grained, moist, 1572.3       577.4         10       8.6       SILT WITH SAND. (ML) gray (10YR 5/1), poorly graded, fine grained, moist, loose, (Fly Ash)       577.1         10       9       8.6       SILT WITH SAND. (ML) gray (10YR 5/1), poorly graded, fine grained, moist, loose, (Fly Ash)       577.1         10       9       9       9       9       577.1         10       9       9       9       577.1       577.1         10       9       9       9       577.1       577.1         10       9       9       9       577.1       577.1         10       9       9       9       577.1       577.1         10       9       9       9       577.1       577.1         10       9       9       9       577.1       573.4         10       9       9       9       573.4       573.4         10       9       9       9       9       573.4       573.4         10       9       9       9       9       9       573.4       573.4         10       9       9       9       9       9						stanning	
5       R       S78.4         10       R       SILT WITH SAND. (ML) gray (10YR 5/1), poorly graded, fine grained, moist, 1058.3       S78.4         10       R       SILT WITH SAND. (ML) gray (10YR 5/1), poorly graded, fine grained, moist, 1058.3       S77.1         10       R       SILT WITH SAND. (ML) gray (10YR 5/1), poorly graded, fine grained, moist, 1058.4       S77.1         10       R       POORLY GRADED SAND WITH SIT. (SP) gray (10YR 5/1), poorly graded, rounded, fine framerine d, fine to medium grained, moist, 1058.4       S77.4         11       Iss       POORLY GRADED SAND, (SP) gray (10YR 3/1), fine grained, rounded, fine to medium grained, saturated, loose, (Fly Ash)       S73.4         15       R       POORLY GRADED SAND, SP) gray (10YR 3/1), poorly graded, rounded, fine to medium grained, saturated, loose, (SII (ML) lenses observed at 24.5-24.7 ft       Bentonite Grout         16       R       R       SILT WITH SAND, ML gray (10YR 3/1), fine grained, saturated, loose, (Fly Ash)       ST2.4         17       R       R       SILT WITH Graph (10YR 3/1), fine grained, saturated, loose, (Fly Ash)       ST2.4         18       R       SILT, (ML) gray (10YR 3/1), fine grained, saturated, loose, (Fly Ash)       ST2.9       ST2.9							
-       -       -       -       578.4         10       -       -       -       578.4         10       -       -       -       -       578.4         10       -       -       -       -       577.1         100       -       -       -       -       577.1         100       -       -       -       -       -       577.1         100       -       -       -       -       -       -       -         -	5						
10       28       35       578.4         10       28       38.1       SILT WITH SAND. (ML) gray (10YR 5/1), poorly graded, fine grained, moist, losse.       577.1         10       28       98.1       PORLY GRADED SAND WITH SILT. (SP) gray (10YR 5/1), poorly graded, rounded, fine to medium grained, moist, losse.       573.4         11       29       13.5       2       PORLY GRADED SAND WITH SILT. (SP) gray (10YR 3/1), poorly graded, rounded, fine to medium grained, saturated, losse.       573.4         15       8       13.5       2       PORLY GRADED SAND, (SP) gray (10YR 3/1), poorly graded, rounded, fine to medium grained, saturated, losse.       573.4         15       8       13.5       2       PORLY GRADED SAND, (SP) gray (10YR 3/1), poorly graded, rounded, fine to medium grained, saturated, losse.       573.4         15       8       10       20       573.4       573.4         15       9       9       10.5       573.4       573.4         15       9       10       20       573.4       573.4         16       9       10.5       10.5       573.4       573.4         17       9       9       10.5       10.5       573.4       573.4         16       9       9       9       10.5       573.4			AU				
10       36.       SILT WITH SAND, (ML) gray (10YR 5/1), poorly graded, fine grained, moist, 1028.3         10       3.8       SILT WITH SAND, (ML) gray (10YR 5/1), poorly graded, fine grained, moist, 1028.3         -       -       -       -         -       -       -       -         -       -       -       -         -       -       -       -         -       -       -       -       -         -       -       -       -       -         -       -       -       -       -         -       -       -       -       -         -       -       -       -       -         -       -       -       -       -         -       -       -       -       -         -       -       -       -       -         -       -       -       -       -       -         -       -       -       -       -       -       -         -       -       -       -       -       -       -       -         -       -       -       -       -       -       -       <							
10       10       10       100000, Organic fragments observed (F/) Ash)       577.1         10       115       115       115         15       135       POORLY GRADED SAND. (SP) gray (10YR 3/1), poorly graded, rounded, fine to medium grained, asturated, loose, SILT WITH SAND. (ML) gray (10YR 3/1), poorly graded, rounded, fine to medium grained, asturated, loose, SILT WITH SAND. (ML) gray (10YR 3/1), poorly graded, rounded, fine to medium grained, asturated, loose, SILT WITH SAND. (ML) gray (10YR 3/1), fine grained, saturated, loose, SILT WITH SAND. (ML) gray (10YR 3/1), fine grained, saturated, loose, GIL SAND. (SP) gray (10YR 3/1), fine grained, saturated, loose, GIL SAND. (SP) gray (10YR 3/1), fine grained, saturated, loose, (Fly Ash)         20       18         20       18         20       18         20       18         20       18         20       18         20       18         20       18         20       18         21       21         22       18         30       18         31       32         32       32 </th <th></th> <th></th> <th></th> <th></th> <th>8.5</th> <th>SILT WITH SAND (ML) area (10VP 5/1) poorly graded fine grained moist</th> <th><u>578.4</u></th>					8.5	SILT WITH SAND (ML) area (10VP 5/1) poorly graded fine grained moist	<u>578.4</u>
POORLY GRADED SAND. (ML) gray (10YR 3/1), fine grained, moist, loose SILT WITH SAND. (ML) gray (10YR 3/1), fine grained, moist, loose SILT WITH SAND. (ML) gray (10YR 3/1), fine grained, saturated, loose, (Fly Ash) POORLY GRADED SAND. (SP) gray (10YR 3/1), fine grained, saturated, loose, (Fly Ash) POORLY GRADED SAND. (SP) gray (10YR 3/1), fine grained, saturated, loose, (Fly Ash) POORLY GRADED SAND. (SP) gray (10YR 3/1), fine grained, saturated, loose, (Fly Ash) SILT WITH SAND. (ML) gray (10YR 3/1), fine grained, saturated, loose, (Fly Ash) SILT WITH SAND. (ML) gray (10YR 3/1), fine grained, saturated, loose, (Fly Ash) SILT WITH SAND. (ML) gray (10YR 3/1), fine grained, saturated, loose, (Fly Ash) SILT WITH SAND. (ML) gray (10YR 3/1), fine grained, saturated, loose, (Fly Ash) SILT WITH SAND. (ML) gray (10YR 3/1), fine grained, saturated, loose, (Fly Ash) SILT WITH SAND. (ML) gray (10YR 3/1), fine grained, saturated, loose, (Fly Ash) SILT WITH SAND. (ML) gray (10YR 3/1), fine grained, saturated, loose, (Fly Ash) SILT WITH SAND. (ML) gray (10YR 3/1), fine grained, saturated, loose, (Fly Ash) SILT WITH SAND. (ML) gray (10YR 3/1), fine grained, saturated, loose, (Fly Ash) SILT WITH SAND. (ML) gray (10YR 3/1), fine grained, saturated, loose, (Fly Ash) SILT WITH SAND. (ML) gray (10YR 3/1), fine grained, saturated, loose, (Fly Ash) SILT WITH SAND. (ML) gray (10YR 3/1), fine grained, saturated, loose, (Fly Ash) SILT WITH SAND. (ML) gray (10YR 3/1), fine grained, saturated, loose, (Fly Ash) SILT WITH SAND. (ML) gray (10YR 3/1), fine grained, saturated, loose, (Fly Ash) SILT WITH SAND. (ML) gray (10YR 3/1), fine grained, saturated, loose, (Fly Ash) SILT WITH SAND. (ML) gray (10YR 3/1), fine grained, saturated, loose, (Fly Ash) SILT WITH SAND. (ML) gray (10YR 3/1), fine grained, saturated, loose, (Fly Ash) SILT WITH SAND. (ML) gray (10YR 3/1), fine grained, saturated, loose, (Fly Ash) SILT WITH SAND. (ML) gray (10YR 3/1), fine grained, saturated, loose, (Fly Ash) SILT WITH SAND. (ML) gray (10YR 3/	10	X	SS		9.8	loose, Organic fragments observed (Fly Ash)	577.1
SILT WITH SAND. (ML) gray (10YR 5/1), fine grained, moist, loose, (Fly Ash) 573.4 5						rounded, fine to medium grained, moist, loose	
13.5       9       573.4         15       9       9       POORLY GRADED SAND, (SP) gray (10YR 3/1), poorly graded, rounded, fine to medium grained, saturated, loose, Silt (ML) lenses observed at 24.5-24.7 ft       + Bentonite Grout         15       9			AU			SILT WITH SAND, (ML) gray (10YR 5/1), fine grained, moist, loose, (Fly Ash)	
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $					13.5		573.4
3     3     3     Silica Sand Filter Pack Screen, 0.010" Slot Size       3     3     Silica Sand Filter Pack Screen, 0.010" Slot Size	15	Х	SS			to medium grained, saturated, loose, Silt (ML) lenses observed at 24.5-24.7 ft $a_{\rm res}$ 29.9-30.0 ft bgs and 34.4.35.0 ft bgs	<ul> <li>Bentonite Grout</li> </ul>
20       30         20       30         25       30         25       30         30       30         30       30         30       30         30       30         30       31         31       32         32       33         33       SILT, (ML) gray (10YR 3/1), fine grained, saturated, loose, (Fly Ash)         551.9       Bentonite Chips						bys, 20.0-00.0 it bys, and 04.4-00.0 it bys.	
20       80         20       80         30       80         30       80         30       80         30       80         31       80         32       80         34.0       SILT, (ML) gray (10YR 3/1), fine grained, saturated, loose, (Fly Ash)         551.9       Bentonite Chips			AU				
20       %         20       %         20       %         1       R         25       %         25       %         30       %         30       %         30       %         31       %         35       %         35       %         35       %         35       %							
-       -	20	Х	SS				
25       S         25       S         25       S         30       S         31       S         32       S         35       S         35       S         35       S         35       S         35       S         35       S         36       S         37       S         S			AU				
25       80         25       80         30       80         30       80         30       80         30       80         30       80         30       80         30       80         30       80         30       80         30       80         30       80         31       80         32       80         35       80         35       80         35       80         35.0       SILT, (ML) gray (10YR 3/1), fine grained, saturated, loose, (Fly Ash)         551.9       Bentonite Chips							
Image: state of the state	25	X	SS		-		
30       80         30       80         30       80         30       80         30       80         30       80         30       80         30       80         31       80         32       80         35       80         35       80         35       80         35       80         35       80         35       80         35       80         35       80         80       80         80       80         80       80         80       80         80       80         80       80         80       80         80       80         80       80         80       80         80       80         80       80         80       80         80       80         80       80         80       80         80       80         80       80         80       80			AU				
30       X					-		
Silica Sand Filter Pack Screen, 0.010" Slot Size 35 SILT, (ML) gray (10YR 3/1), fine grained, saturated, loose, (Fly Ash) 551.9	30		SS				
Screen, 0.010" Slot Size 34.0 35.0 SILT, (ML) gray (10YR 3/1), fine grained, saturated, loose, (Fly Ash) 551.9			_				Silica Sand Filter
			AU				Screen, 0.010" Slot
35 X 00 SILT, (ML) gray (10YR 3/1), fine grained, saturated, loose, (Fly Ash) 551.9					34.0		552.9
	35	Ж	SS		35.0	SILT, (ML) gray (10YR 3/1), fine grained, saturated, loose, (Fly Ash)	551.9