Bottom Ash Pond and Ponds 0-8 Closure Work Plan

B.C. COBB GENERATING FACILITY

BOTTOM ASH POND AND PONDS 0-8 CLOSURE WORK PLAN

Muskegon, Michigan

Submitted To: Consumer Energy Company
1945 W. Parnall Road
Jackson, Michigan 49201

Submitted By: Golder Associates Inc.
15851 South US 27, Suite 50
Lansing, Michigan 48906

September 20, 2019 **1667572**

Golder Associates

Table of Contents

1.0 CLOSURE WORK PLAN OVERVIEW AND OBJECTIVES 1
2.0 FACILITY BACKGROUND 2
3.0 REGULATORY BACKGROUND 3
4.0 SELF-IMPLEMENTATION OF CLOSURE BY REMOVAL OF CCR 4
4.1 Narrative Summary of Closure 4
4.2 CCR Removal and Documentation – Phase I 5
4.2.1 CCR Excavation and Documentation Summary 5
4.2.1.1 Removal Criteria Background 6
4.2.2 Documentation of CCR Removal Overview 8
4.2.2.1 Documentation of Excavation Grades – First Line of Evidence 8
4.2.2.2 Photographic Documentation – Second Line of Evidence 9
4.2.2.3 Colorimetric Confirmation – Third Line of Evidence 9
4.2.2.4 Field Microscopic Quantification of CCR Content - Alternative Third Line of Evidence 10
4.3 Post-Excavation Monitoring – Phase II 10
5.0 CLOSING 12
6.0 REFERENCES 13

List of Tables

Table 1 RCRA CCR Constituents from Appendix III and Appendix IV

List of Figures

Figure 1 General Site Plan
Figure 2 B.C. Cobb Bottom Ash Pond and Ponds 0-8 Closure Schedule
Figure 3 Bottom Ash Pond and Ponds 0-8 Excavation Plan
Figure 4 Boron Concentrations in CCR and Native Soils
Figure 5 Colorimetry Results for CCR and Native Soils
Figure 6 Site-Specific Calibration Curve for Colorimetric Analysis

List of Appendices

Appendix A Site Boring Photographs
Appendix B Soil Boring Logs

1.0 CLOSURE WORK PLAN OVERVIEW AND OBJECTIVES

This closure work plan is a revision from the original closure work plan that was prepared to request agreement from the Michigan Department of Environmental Quality (MDEQ) with Consumers Energy Company's (CEC) plan to close the Bottom Ash Pond and Ponds 0-8 at its B.C. Cobb Generating Facility (BC Cobb) located in Muskegon, Michigan. The original closure work plan was submitted to the MDEQ on May 31, 2018. On August 13, 2018 CEC provided a technical memo as a response to MDEQ questions concerning the CCR surface impoundment boundaries. On October 16, 2018, the MDEQ provided a letter to CEC accepting the closure work plan submitted on May 31, 2018 and the memo submitted on August 13, 2018. This revised closure work plan includes an updated CCR removal surface that was proposed in the August 13, 2018 memo to the MDEQ.

This document provides a general description of the following:

- Plans for removal of waste
- Multiple lines of evidence to document waste removal including the basis for an objective waste removal standard to address potential long-term sources of groundwater impacts
- Schedule for implementing the work
- Performance monitoring after waste removal in accordance with the CCR RCRA Rule

CEC provided the Notification of Intent to Initiate Closure of the Bottom Ash Pond and Ponds 0-8 to the Michigan Department of Environmental Quality on March 30, 2018, per 40 CFR 257.102(g). CEC plans to initiate construction for closure of the Bottom Ash Pond and Ponds 0-8 in 2020.

This closure work plan proposes an identical CCR removal method and similar documentation procedures that were previously approved by the MDEQ and implemented for closing and documenting removal of CCR for Bottom Ash Pond 3N at the J.H. Campbell Generating Facility (JH Campbell) in West Olive, Michigan (JHC Bottom Ash Pond 3N). CCR was removed from JHC Bottom Ash Pond 3N from March 2017 through June 2017. The removal was documented in the *J.H. Campbell Generating Facility Bottom Ash Pond 3N CCR Removal Documentation Interim Report* (JHC Bottom Ash Pond 3N Closure Report; Golder, 2017), which was submitted to the MDEQ on June 20, 2017 and approved on July 18, 2017.

2.0 FACILITY BACKGROUND

BC Cobb was a coal-fueled power generating facility located in Muskegon, Michigan. The plant operated five coal-burning units (Units 1 through 5) and later converted three to natural gas peaking units (Units 1 through 3). Beginning with plant operation in the 1940s, CCR produced by the coal-fired power generation units (fly ash and bottom ash) was disposed in the area currently occupied by the Bottom Ash Pond and Ponds 0-8. Based on a review of historical documentation, the exterior berm surrounding the area currently occupied by the Bottom Ash Pond and Ponds 0-8 was constructed prior to July 1968. Ponds 0, 1, 2, 3, and 4 were also constructed prior to July 1968. Ponds 5, 6, 7, and 8 were constructed prior to April 1977. As of 1984, CCR was deposited exclusively in the Bottom Ash Pond and Ponds 0-8 by wet sluicing methods. The locations of the Bottom Ash Pond and Ponds 0-8 are provided on Figure 1 – General Site Plan. Electrical generation at BC Cobb ceased on April 15, 2016.

While receiving CCR, the Bottom Ash Pond and Ponds 0-8 water surface elevations were maintained at an approximate elevation of 588 feet NAVD88. Currently, the Bottom Ash Pond and Ponds 0-8 water surface elevations are at an approximate elevation of 580 feet NAVD88.

3.0 REGULATORY BACKGROUND

CEC has identified the Bottom Ash Pond and Ponds 0-8 at BC Cobb as “existing CCR surface impoundments” under the CCR RCRA Rule, as they were directly receiving and storing commingled CCR and low volume miscellaneous wastewaters as of the effective date (October 19, 2015) of the CCR RCRA Rule. As such, there are specific criteria and schedules under the CCR RCRA Rule for CEC to conduct closure.

The BC Cobb Bottom Ash Pond and Ponds 0-8 were not licensed as units for waste disposal under the Michigan Natural Resources and Environmental Protection Act (NREPA) Part 115. Instead, the Bottom Ash Pond and Ponds 0-8 were permitted under Michigan’s NREPA Part 31 as part of the National Pollution Discharge Elimination System (NPDES). A solid waste disposal area construction permit authorizing conditions for storage and/or disposal was not issued for the ponds pursuant to solid waste authorities, since the wastewaters containing CCR discharging into the Bottom Ash Pond and Ponds 0-8 were “other wastes regulated by statute”, as defined in Rule 110 of the Part 115 Solid Waste Rules. This regulatory exception to authorize activity only under the NPDES permit is limited in scope and application with respect to the disposal and end of life considerations of CCR from these units. Furthermore, CEC has regularly removed CCR from these ponds for beneficial use markets or disposal in the JH Campbell Dry Ash Landfill.

4.0 SELF-IMPLEMENTATION OF CLOSURE BY REMOVAL OF CCR

CEC intends to close the Bottom Ash Pond and Ponds 0-8 by removal of CCR in accordance with self-implementing requirements under the CCR RCRA Rule. Upon approval of the closure work plan, CEC intends for this document to serve as an agreement with MDEQ on applicable elements of its self-implementing plan to achieve closure in accordance with the CCR RCRA Rule. Documentation and certifications necessary under the CCR RCRA Rule will be provided to MDEQ as part of the notification requirements to the relevant State Director detailed in 40 CFR 257.106. Additionally, the applicable certifications and documents will be posted to the CCR Rule Compliance Data and Information publicly-available website pursuant to 40 CFR 257.107.

As part of closure self-implementation, the United States Environmental Protection Agency (EPA) required an initial closure plan certified by a qualified professional engineer to be placed in the operating record and posted on a publicly-accessible internet site for existing CCR surface impoundments by October 17, 2016, which has been completed. The initial closure plan indicated that the Bottom Ash Pond and Ponds 0-8 would be closed with CCR in place. However, CEC determined it is likely feasible to close the Bottom Ash Pond and Ponds 0-8 by removal of CCR as described herein, assuming it is feasible to dewater as necessary to verify CCR removal. Therefore, the RCRA Closure Plan for the Bottom Ash Pond and Ponds 0-8 was revised, placed in the CCR unit operating record, and posted on CEC's publicly-accessible internet site.

4.1 Narrative Summary of Closure

The Bottom Ash Pond and Ponds 0-8 will be closed by removal of visible CCR. This plan is consistent with the clearly visible interface between CCR and underlying substrate materials observed at the base of the Bottom Ash Pond and Ponds 0-8 in sonic core and borehole soil samples recovered from site investigations, as shown in photographs provided in Appendix A – Site Boring Photographs. Removal of all visible CCR is also in accordance with 40 CFR 257.102(c), which states "CCR removal and decontamination of the CCR unit are complete when constituent concentrations throughout the CCR unit and any areas affected by releases from the CCR unit have been removed and groundwater monitoring concentrations do not exceed the groundwater protection standard established pursuant to 257.95(h)." The CCR RCRA Rule also prescribes the closure timeframe for existing CCR surface impoundments as five years from the commencement of closure activities [40 CFR 257.102(f)(1)(ii)].

The Bottom Ash Pond and Ponds 0-8 will be closed in compliance with the CCR RCRA Rule using a phased approach that will include: 1) physical removal of CCR for purposes of removing regulated waste and sources of potential long-term groundwater contamination, and 2) use of the balance of the five-year closure timeframe provided for in 40 CFR 257.102(f)(1)(ii) to demonstrate the concentrations of Appendix IV

constituents of concern do not exceed groundwater protection standards established pursuant to 257.95(h). This compliance monitoring schedule is provided in Figure 2.

The horizontal excavation limits of CCR in the Bottom Ash Pond and Ponds 0-8 will extend to the wetted pond boundary on the northern and western exterior perimeter berms. The eastern excavation limits of CCR extend one foot beyond the wetted pond boundary to provide additional assurance that post-1979 CCR is removed, as discussed in *B.C. Cobb Ponds 0-8 and Bottom Ash Pond Closure Work Plan Closure Boundaries Technical Memo* dated August 6, 2018 (Golder, 2018). CCR removal limits have been adjusted around existing transmission pole foundations and a substation to the south. Interior berms that separate the individual ponds will be removed. The lateral extent of the Bottom Ash Pond and Ponds 0-8 excavation limits is shown on Figure 1.

The excavation will reach approximate depths of 3 to 30 feet below the existing grade. Proposed excavation contours are provided in Figure 3 – Bottom Ash Pond and Ponds 0-8 Excavation Plan. CEC does not plan to regrade and/or backfill the ponds once the CCR is removed.

4.2 CCR Removal and Documentation – Phase I

The first phase of closure activities will be CCR removal and documentation. Descriptions of activities to remove CCR and document adequate removal are provided in this section, along with the basis for the various lines of evidence.

4.2.1 CCR Excavation and Documentation Summary

This section provides a list of the tasks to be completed during excavation and documentation and includes more details regarding method development and rationale. Excavation will be performed to remove CCR to elevations identified during site investigations; visual observations and field analyses will be made to confirm the CCR removal objective is met. Documentation of CCR removal will then be performed to provide lines of evidence that validate the extent of the excavation and visual observations made in the field. During CCR removal and documentation, the following tasks will be completed:

- Excavation
  - The Bottom Ash Pond and Ponds 0-8 will be dewatered by actively pumping in a manner that maintains NPDES permitted effluent limits.
  - Hydraulic structures will be abandoned in-place or removed
  - CCR removal will be complete when the following are achieved:
    - The contractor meets horizontal and vertical excavation limits determined from previous site investigations, and,
    - Visual observations determine that the CCR removal objective has been met
- Documentation and final certification

- Final excavation grades will be compared to the elevations of known CCR at the base of the Bottom Ash Pond and Ponds 0-8 developed from previous site investigations
- Photographs will be taken to document CCR removal in excavated areas
- Quantitative colorimetric analysis will be completed to confirm CCR removal meets objective limits:
  - As an alternative to quantitative colorimetric testing, microscopic quantification of CCR content, as described in the Pond 3N Closure Report (Golder, 2017), will be used to confirm CCR removal if excavated areas are influenced by soils that do not match the site-specific colorimetric curve developed for closure of the Bottom Ash Pond and Ponds 0-8

Results will be documented in a BC Cobb Bottom Ash Pond and Ponds 0-8 CCR removal documentation report. Detailed descriptions and supporting information to describe the activities proposed to document CCR removal are included in the subsequent sections.

4.2.1.1 Removal Criteria Background

CEC is proposing to implement the same methodology for documenting removal of CCR at BC Cobb Bottom Ash Pond and Ponds 0-8 that was developed for closing JH Campbell Bottom Ash Pond 3N. Various characteristics of CCR were evaluated to determine the feasibility of different methods to document CCR removal including color, density, particle size, and particle shape. Based on evaluation of the material characteristics, color, as determined by visual inspection and confirmed by digital quantitative colorimetric analysis, was determined to be superior to other documentation methods such as centrifuge separation, petrography via microscope, or scanning electron microscopy with electron dispersive X-ray spectroscopy (SEM/EDX) because CCR is significantly darker than the native sand material at the BC Cobb site. The visually-apparent transition from CCR to underlying native materials at the Bottom Ash Pond and Ponds 0-8 is similar to the conditions observed at JHC Bottom Ash Pond 3N/S, which is to be expected since BC Cobb is located approximately 25 miles north of JH Campbell. The density of the CCR and native sands is too similar for centrifugal separation; sieving is not practical due to the overlapping range of particle sizes for the different materials; and SEM/EDX is a different visual/color analysis, which requires complex equipment that cannot be readily mobilized to the field and specific personnel to operate it. Colorimetry allows evaluation of larger sample sizes and is easily adapted for use in the field; thus, it also has the potential for additional sampling to verify reproducibility of results. Therefore, colorimetry was selected as the final and preferred line of evidence to identify and quantify the amount of CCR present in samples collected from the Bottom Ash Pond and Ponds 0-8 excavation footprint.

Some color variability may exist in native soils at the base of the excavation footprint due to their deposition in a fluvial system, and therefore an adaptive testing method has been developed. Based on colorimetric and microscopic evaluation of bottom ash, fly ash, and native soils, Golder found that darker color variations are more likely to occur, which have the effect of causing an over-estimation of the CCR content in the sample (i.e. 'false negative' results) when compared to the typical color of the sand grains that comprise most native soils at BC Cobb (typically the lightest in color of all materials present). If native soil color variability is encountered at one of the grid nodes identified for colorimetric testing, field microscopic quantification of CCR content will be utilized to determine if the CCR removal objective was met.

The composition of CCR and underlying soil samples collected from the Bottom Ash Pond and Ponds 0-8 by drilling (64 samples of CCR and 48 samples of underlying soils) were compared to the MDEQ Cleanup Criteria Requirements for Response Activity, R 299.48 Generic Soil Cleanup Criteria for Non-residential Category Groundwater and Surface Water Interaction (GSI) protection and drinking water protection criteria to determine which constituents could be used as indicators of potential groundwater impacts.

A site-specific threshold for CCR removal was selected as a ratio of CCR and underlying soil that would reduce the boron concentration of the mixed materials to less than the respective non-residential drinking water protection criteria for soil. This quantitative threshold for boron is shown on the graph in Figure 4 – Boron Concentrations in CCR and Native Soils by reading the x-axis value where the trend line between the average (mean) boron concentrations measured in the CCR and the underlying soils intercepts the non-residential drinking water criteria. Based on Figure 4, the threshold for boron is between 5 percent and 10 percent CCR. Therefore, to be conservative, an initial threshold of 5 percent CCR was selected based on the non-residential drinking water protection criteria for boron. The selected threshold of 5 percent CCR is consistent with the threshold established for JH Campbell Bottom Ash Ponds 3N/S, which was demonstrated to be achievable during construction.

Cobalt, lithium, mercury, molybdenum, and selenium also occur in samples of CCR from the Bottom Ash Pond and Ponds 0-8 at concentrations that may exceed the GSI or non-residential drinking water protection criteria, but require less removal of CCR than boron to meet the respective criteria. Barium, beryllium, cadmium, chromium (III), copper, fluoride, lead, thallium, and zinc are not included as indicator constituents in this assessment because they were not detected in CCR or they exist in native soils at concentrations greater than their respective GSI protection or drinking water protection criteria. Antimony and silver were not considered, because they were not detected in CCR at concentrations above their respective method detection limits. Arsenic was removed from the list of potential indicator constituents because the state background level exceeds GSI and non-residential drinking water protection criteria and even with complete removal of CCR, any material tested has the potential to exceed the GSI protection criteria for arsenic.

4.2.2 Documentation of CCR Removal Overview

An objective standard of 95 percent CCR removal (i.e. 95 percent sand and 5 percent CCR in the soil mixture at the base of the excavation) has been established. Although the purpose of this work plan is to define methods for removal of CCR as a regulated waste, the 95 percent removal criteria is based on chemical analyses that have shown the criteria to be protective of groundwater based on non-residential drinking water criteria.

Verification of CCR removal will be documented based on the following three lines of evidence:

- First line of evidence – comparison of interim excavation termination grades to known elevations of CCR from previous site characterizations and engineering records
- Second line of evidence – photographic documentation including periodic photographs of CCR removal progression and photographs of excavated areas at random grid nodes
- Third line of evidence – quantitative colorimetric analysis at random grid nodes to confirm CCR removal
  - As an alternative to quantitative colorimetric testing, microscopic quantification of CCR content will be used to confirm CCR removal if excavated areas are influenced by soils that do not match the site specific colorimetric curve developed for closure of the Bottom Ash Pond and Ponds 0-8

This multiple lines of evidence approach provides a predictable and reliable means to objectively measure concentrations of CCR based on physical sample properties. The basis for this approach relies on laboratory analyses that demonstrate how the criteria are protective of groundwater. The approach takes advantage of the visible demarcation between CCR and the underlying soil at the base of the Bottom Ash Pond and Ponds 0-8 observed during previous removal activities and in soil borings, and uses these material characteristics to identify and quantify CCR.

4.2.2.1 Documentation of Excavation Grades – First Line of Evidence

The first line of evidence to assess CCR removal activities will be to confirm that excavations are complete to at least the elevation established as the base of CCR from existing information. The elevation of the base of CCR was established based on historical facility information and drilling and sampling completed in the Bottom Ash Pond and Ponds 0-8 in October 2015, May 2017, and November and December 2017. Descriptions of sample materials were used to prepare boring logs for each boring. The boring logs are included in Appendix B – Soil Boring Logs. The boring logs identified CCR up to a depth of 23.2 feet below ground surface in the Bottom Ash Pond [elevation 575 feet (NAVD88)] and 22.1 feet (12.5 foot of CCR submerged below 9.6 feet of water) in Ponds 0-8 [elevation 565.2 feet (NAVD88)].

Once the excavation has met the horizontal and vertical limits shown in Figure 3, visual observations for the presence of CCR will be completed. Excavated areas that do not meet the CCR removal objective

based on visual inspections within the horizontal CCR removal limits will be excavated further until the CCR removal objective is met.

4.2.2.2 Photographic Documentation – Second Line of Evidence

Consistent with MDEQ guidance, Sampling Strategies and Statistics Training Materials for Part 201 Cleanup Criteria (S3TM); a 50-foot grid will be established across the excavation area for assessment, and the grid nodes to be sampled will be selected using a random number generator (the outer extent of the grid depends on the materials encountered during excavation). Photographic documentation will be completed on 50 percent of the nodes followed by hand sampling and colorimetric analysis at 50 percent of the photographed nodes.

The excavation surface will be inspected visually to identify residual CCR materials that are present on the exposed surface of the excavation. If CCR is still visible, additional material will be removed.

When no or only minor visible signs of CCR are observed, photographs and written descriptions will be taken at 50 percent of the grid nodes to document the material left in place. The photography procedure will be standardized such that it includes the following elements:

- Photographs will be taken of the general area-wide excavation
- Photographs will be taken of a representative sample measuring approximately one-square-foot area of surficial materials present at the base of the excavation at each grid node
- Photographs will be taken from a standardized height (approximately 2.5 feet) to ensure the same area and level of detail is obtained by each photograph
  - The camera will be positioned directly over the excavated surfaced facing downwards with as little tilt as possible
  - Photographs will have a pixel resolution of 4608 x 3456 (i.e., 15.9 megapixels)

4.2.2.3 Colorimetric Confirmation – Third Line of Evidence

A colorimetric analysis method that utilizes a digital colorimeter instrument to precisely measure the color of a soil sample will be used to verify CCR removal. The analysis will be conducted in general accordance with ASTM E1347, Standard Test Method for Color and Color-Difference Measurement by Tristimulus Colorimetry. The method involves measuring color values of a field sample and converting these values with a color-concentration calibration curve to determine the amount of CCR in the sample.

Colorimetry testing was performed on 14 samples of CCR and 9 samples of native soil obtained from the November and December 2017 investigation to establish end member color values for the different types of material that will be encountered during excavation. Results of the colorimetry analysis used to support the development of a color threshold value are provided in Figure 5. A combination of darker (lower RGB integer value) native soil samples and lighter (higher RGB integer value) CCR samples were selected to

create mixtures of 1%, 2%, 3%, and 5% CCR to develop a series of conservative site-specific color-concentration curves. To be further conservative, the ultimate color threshold, which is included as Figure 6, is based on a series of fly ash and native soil mixtures that produced the lightest color values of the laboratory-prepared mixtures. While a fly ash-native soil contact may only occur in a limited number of locations, a darker contrast is anticipated when bottom ash is in contact with native soil, which is more easily detected. The repeatability of the color-concentration curve at estimating the CCR content and identifying materials that contain more than 5 percent CCR, was validated in the laboratory using blind testing of "unknown" mixtures of low concentrations of CCR (less than 10 percent) prepared by one chemist and analyzed by a different chemist.

The colorimetry method described herein is easily adapted for use in the field and can be performed on replicate samples (three to five readings are typical), which increases the reproducibility of the analysis and allows for rapid response if the readings yield inconsistent results. Because the method has been validated in the laboratory, it does not rely solely on a field expert's judgement when examining CCR.

Soil samples will be collected from the base of the excavation at randomly-selected locations using the same grid node methodology developed for the photographic documentation. Fifty percent of the photographed grid nodes will be randomly selected for CCR quantification by colorimetry. The samples will be tested in the field to evaluate the presence of CCR materials. These samples will only be collected from grid nodes after the excavation has reached a depth such that there are no visible signs of CCR present.

4.2.2.4 Field Microscopic Quantification of CCR Content - Alternative Third Line of Evidence

As previously discussed, color determined by visual inspection and confirmed by colorimetric analysis was determined to be superior to other documentation methods because CCR is significantly darker than the underlying native sand material at BC Cobb. However, our experience documenting CCR removal at JHC Bottom Ash Pond 3N demonstrated that some color variability can exist in certain soils at the base of the excavation footprint and cannot be identified in every instance prior to excavation. If similar conditions exist at the Bottom Ash Pond and Ponds 0-8, microscopic quantification of CCR content will be utilized to confirm the CCR removal objective was met as an alternative line of physical evidence.

4.3 Post-Excavation Monitoring – Phase II

After removal of the CCR in Phase I, CEC will use the balance of the five-year closure timeframe provided in 40 CFR 257.102(f)(1)(ii) to demonstrate the concentrations of Appendix IV constituents of concern do not exceed groundwater protection standards established pursuant to 257.95(h) for two consecutive sampling events.

The current RCRA CCR groundwater monitoring system for BC Cobb Bottom Ash Pond and Ponds 0-8 consists of 23 monitoring wells that are depicted in Figure 1. These monitoring wells were installed during

the fourth quarter of 2015 to commence a compliance program pursuant to 40 CFR 257.91(e)(1). This monitoring well network is anticipated to be used to determine compliance with groundwater protection standards and achievement with the standard of clean closure pursuant to 40 CFR 257.102(c).

The initial Annual Groundwater Monitoring and Corrective Action Report for the BC Cobb site was certified by January 31, 2018 with notifications to the State Director and public posting to the CCR Rule Compliance Data and Information website by March 2, 2018. A schedule for the groundwater implementation program is provided in Figure 2. If the groundwater-based standard cannot be achieved following removal and verification that CCR has been removed to the 5 percent threshold standard, then the necessary technical requirements are in place to implement an assessment monitoring program and corrective actions, if necessary.

Groundwater samples collected at BC Cobb are submitted for the analyses specified in 40 CFR 257, Appendix III and IV. The analytical methods and reporting limits for each constituent are summarized in Table 1 - RCRA CCR Constituents from Appendix III and Appendix IV.

There are differences between the CCR RCRA Rule monitoring requirements and MDEQ requirements (e.g. field-filtering). Therefore, a more detailed groundwater monitoring program will be provided to MDEQ upon excavation and verification of CCR removal that will include a Sampling and Analysis Plan (SAP), definition of groundwater monitoring system, and coordination with groundwater sampling protocols and analyses pursuant to State groundwater monitoring requirements. It is anticipated that the existing groundwater monitoring well network will be utilized to collect a subset of field-filtered samples utilizing the analyte list from Rules 450, 451, and 452.

5.0 CLOSING

This closure work plan is respectfully submitted to CEC. If you have questions or require additional information, please contact Mark Bergeon at (920) 491-2500.

Sincerely,

GOLDER ASSOCIATES INC.

Hugh Davies
Senior Geochemist

Mark Bergeon, PG
Program Leader, Associate

Jeff Piaskowski, PE
Senior Project Engineer

6.0 REFERENCES

Golder, 2017, J.H. Campbell Bottom Ash Pond 3 N CCR Removal Documentation Interim Report, June 2017.

Golder, 2018, B.C. Cobb Ponds 0-8 and Bottom Ash Pond Closure Work Plan Closure Boundaries Technical Memo, August 6, 2018.

"Standards for the Disposal of Coal Combustion Residuals in Landfills and Surface Impoundments," Title 40 – Protection of the Environment Part 257 – Criteria for Classification of Solid Waste Disposal Facilities and Practices Subpart D – Standards for the Disposal of Coal Combustion Residuals in Landfills and Surface Impoundments.

TABLES

Table 1 – RCRA CCR Constituents from Appendix III and Appendix IV

Appendix III to Part 257—Constituents

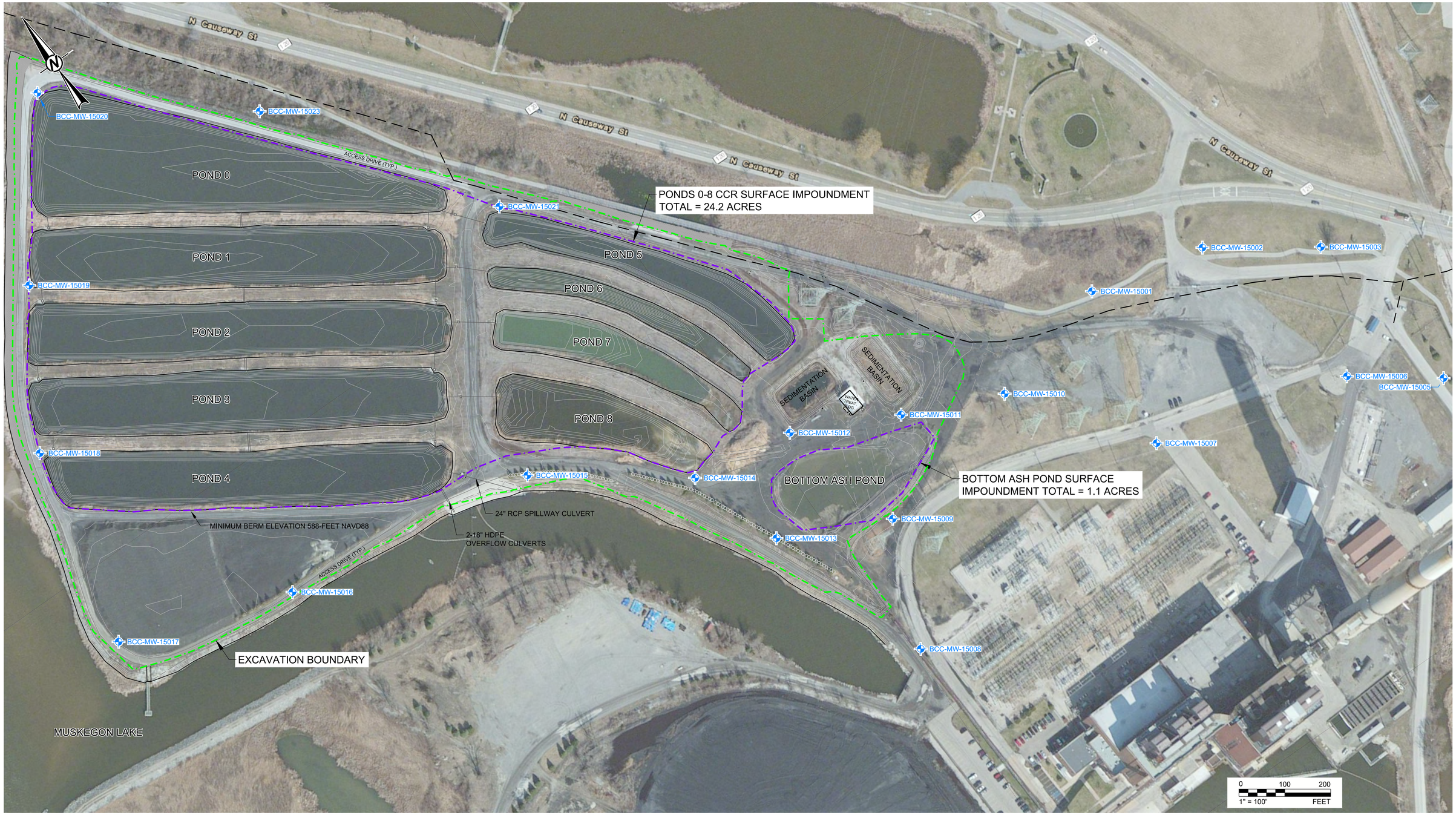
Constituent	Analytical method	Preservation	Hold Time (Days)	Reporting Limit (µg/L)
Boron	EPA 6020B	HNO_3, pH <2	180	20
Calcium	EPA 6020B	HNO_3, pH <2	180	1,000
Chloride	EPA 300.0	None, <6ºC	28	1,000
Fluoride[#]	EPA 300.0	None	28	1,000
pH	Stabilized field measurement	NA	NA	0.1 standard units
Sulfate	EPA 300.0	None, <6ºC	28	2,000
Total Dissolved Solids	SM 2540C	None, <6ºC	7	1,000

HNO_3 – Nitric acid
NA – Not applicable

Appendix IV to Part 257—Constituents

Constituent	Analytical method	Preservation	Hold Time (Days)	Reporting Limit (µg/L)
Antimony	EPA 6020B	HNO_3, pH <2	180	1
Arsenic	EPA 6020B	HNO_3, pH <2	180	1
Barium	EPA 6020B	HNO_3, pH <2	180	5
Beryllium	EPA 6020B	HNO_3, pH <2	180	1
Cadmium	EPA 6020B	HNO_3, pH <2	180	0.2
Chromium, total	EPA 6020B	HNO_3, pH <2	180	1
Cobalt	EPA 6020B	HNO_3, pH <2	180	15
Fluoride[#]	EPA 300	None, <6ºC	28	1,000
Lead	EPA 6020B	HNO_3, pH <2	180	1
Lithium	EPA 6020B	HNO_3, pH <2	180	10
Mercury	EPA 7470A	HNO_3, pH <2	28	0.2
Molybdenum	EPA 6020B	HNO_3, pH <2	180	5
Selenium	EPA 6020B	HNO_3, pH <2	180	1
Thallium	EPA 6020B	HNO_3, pH <2	180	2
Radium 226 and 228 combined[^]	EPA 903.1/904.0	HNO_3, pH <2	None	1 picocurie per liter

FIGURES



LEGEND

- GROUNDWATER MONITORING WELL
- EXISTING MAJOR AND MINOR TOPOGRAPHIC CONTOUR
- EXCAVATION BOUNDARY
- SURFACE IMPOUNDMENTS
- CULVERT
- CONCRETE VAULT
- TREE LINE
- POWER LINE AND TOWER STRUCTURE
- WASTEWATER PRESSURIZED WATER MAIN (SEE REFERENCE 2)

REFERENCE(S)

1. TOPOGRAPHIC SURVEY PROVIDED BY SUMMIT SURVEYING, INC.; DATED JANUARY 28, 2015.
2. WASTEWATER PRESSURIZED WATERMAIN FROM GIS SHAPEFILE WASTEWATER_PRESSURIZED_MAIN.SHP, PROVIDED BY MUSKEGON COUNTY WASTE MANAGEMENT SYSTEM ON JUNE 22, 2018.

CLIENT
CONSUMERS ENERGY COMPANY
151 N. CAUSEWAY
MUSKEGON, MI 49445

CONSULTANT
Golder Associates

YYYY-MM-DD	2019-09-06
DESIGNED	MAB
PREPARED	AM
REVIEWED	JRP
APPROVED	MAB

PROJECT
B.C. COBB PLANT
BOTTOM ASH POND AND PONDS 0-8 EXCAVATION PLAN
MUSKEGON, MI 49445

TITLE
GENERAL SITE PLAN

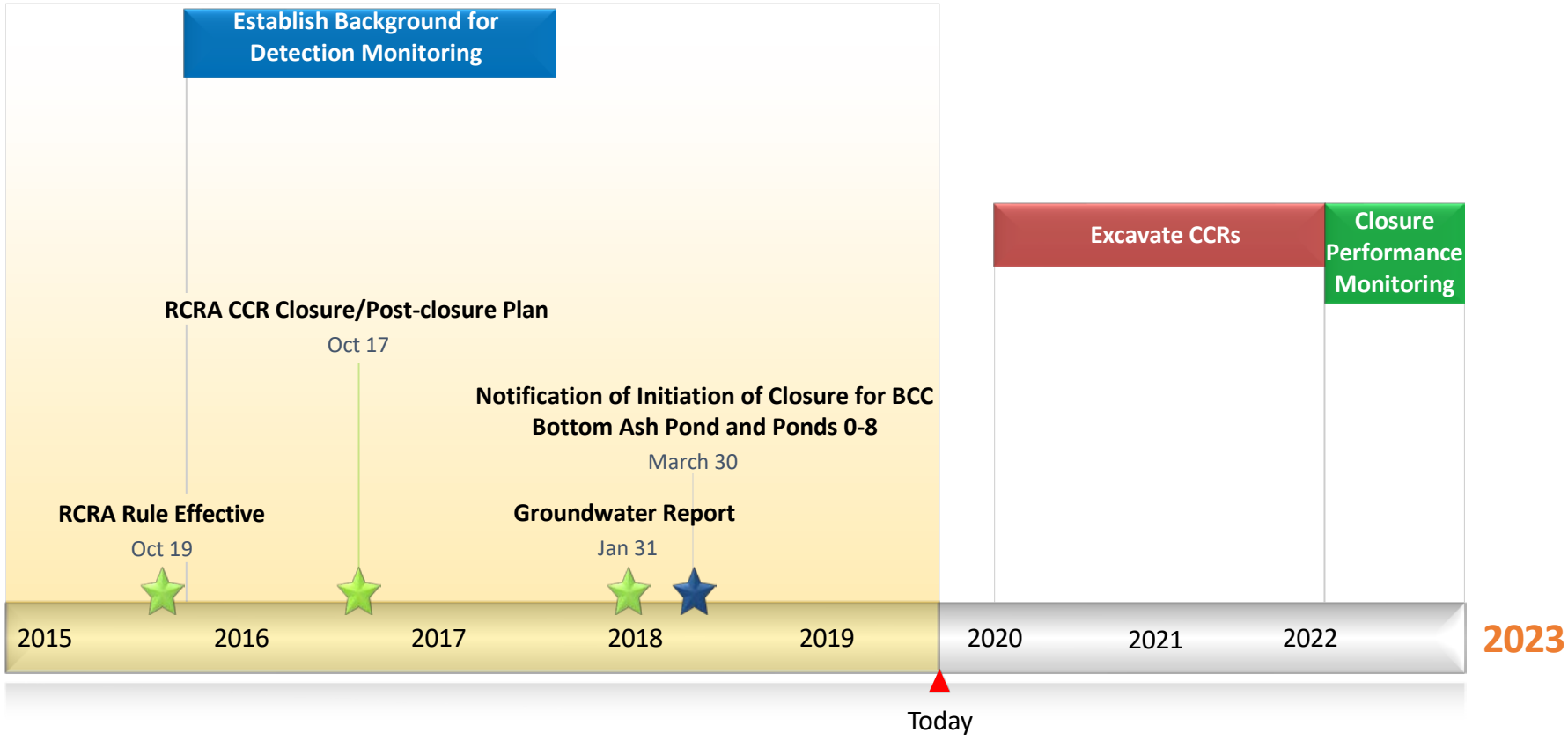
PROJECT NO.	CONTROL	REV.	FIGURE
1667572	B015	0	1

Path: \\mtlaurel\cadd\Projects\2016\1667572 Consumers - BC Cobb\PRODUCTION\B - Closure Strategies\ | File Name: 1667572B015.dwg

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI D

0 1 in

Figure 2 – BC Cobb Bottom Ash Pond and Ponds 0-8 Closure Schedule



LEGEND

- EXCAVATION BOUNDARY
- CONCEPTUAL EXCAVATION SURFACE

NOTES

1. BOTTOM OF CCR SURFACE DEVELOPED FROM 2015-2017 SITE INVESTIGATIONS.
2. 1 FT BELOW BOTTOM OF CCR SURFACE WAS DEVELOPED BY LOWERING THE BOTTOM OF CCR SURFACE VERTICALLY 1 FT.

CUT VOLUME = 653,713 C.Y.

CLIENT
CONSUMERS ENERGY COMPANY
151 N. CAUSEWAY
MUSKEGON, MI 49445

CONSULTANT
Golder Associates

YYYY-MM-DD	2019-02-06
DESIGNED	JRP
PREPARED	AM
REVIEWED	JRP
APPROVED	MAB

PROJECT
B.C. COBB PLANT
BOTTOM ASH POND AND PONDS 0-8 EXCAVATION PLAN
MUSKEGON, MI 49445

TITLE
BOTTOM ASH POND AND PONDS 0-8 EXCAVATION PLAN

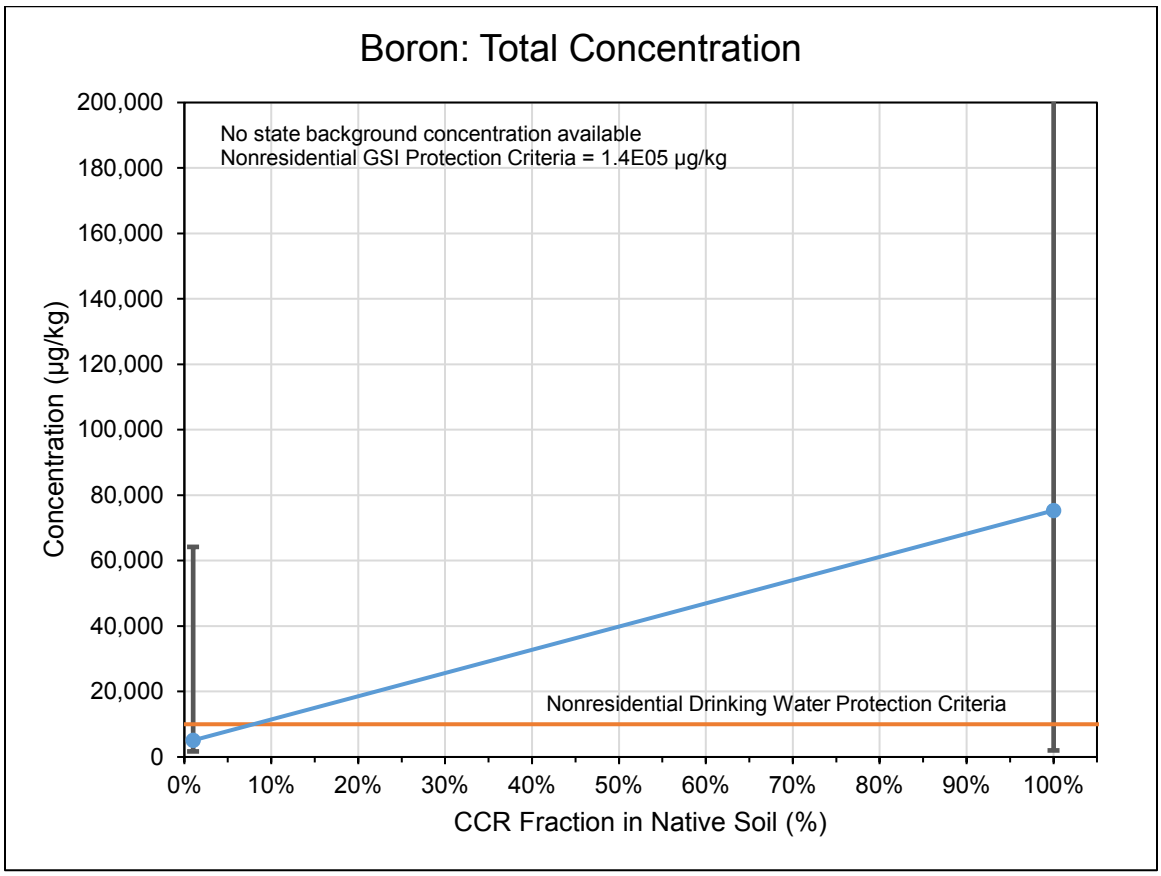
PROJECT NO.	CONTROL	REV.	FIGURE
1667572	B014	1	3

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

1 in
0

Path: \\mlaurel\cadd\Projects\2016\1667572 - Consumers - BC Cobb\PRODUCTION\B - Closure Strategies\ | File Name: 1667572B014.dwg

Figure 4 – Boron Concentrations in CCR and Native Soils



Notes:
Orange line shows Nonresidential Drinking Water Protection criteria for boron in soil (10,000 µg/kg).
Blue line shows average metals concentrations in CCR and native soil connected by a trend line to allow comparison.
Error bars show maximum and minimum concentrations measured in all 64 CCR and 48 underlying native soil samples.

Figure 5 – Colorimetry Results of CCR and Native Soil

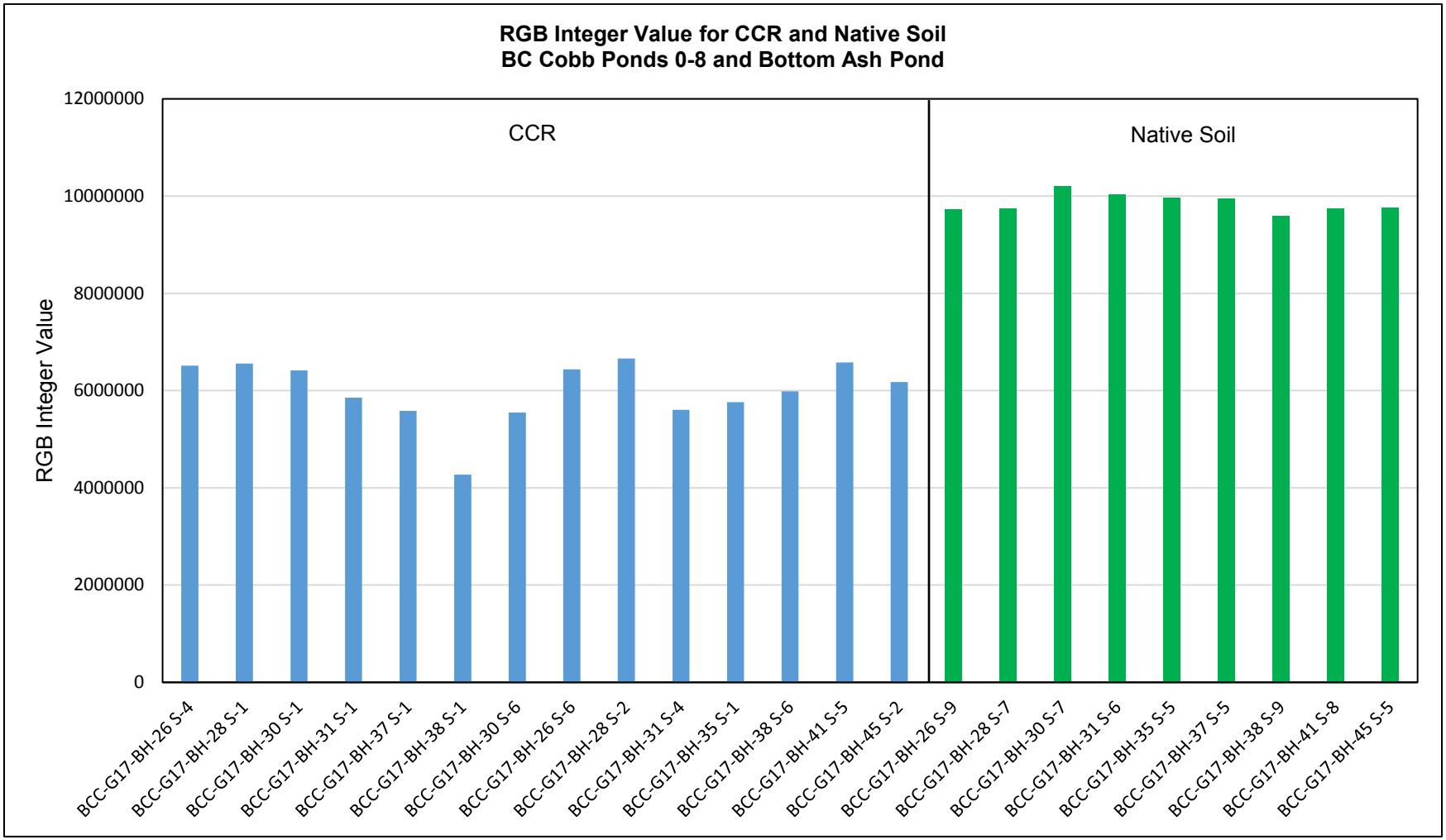
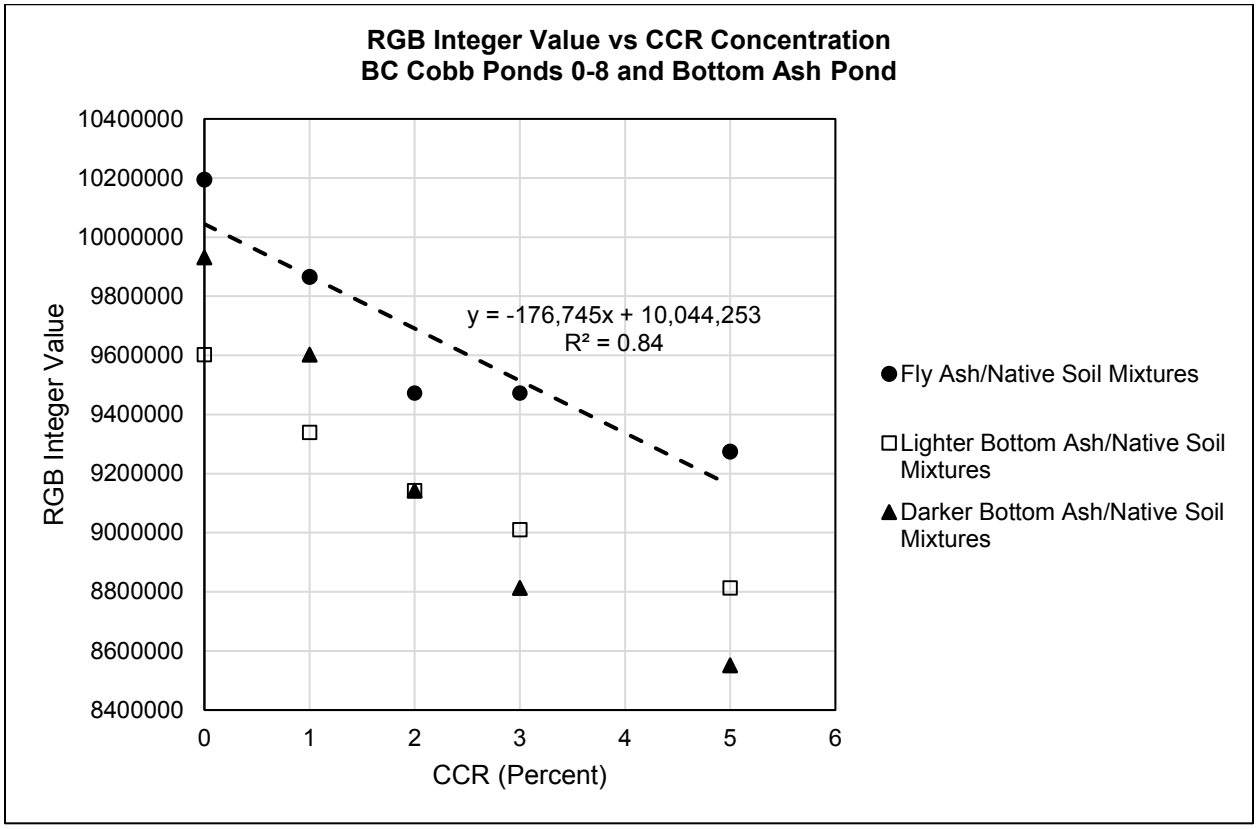
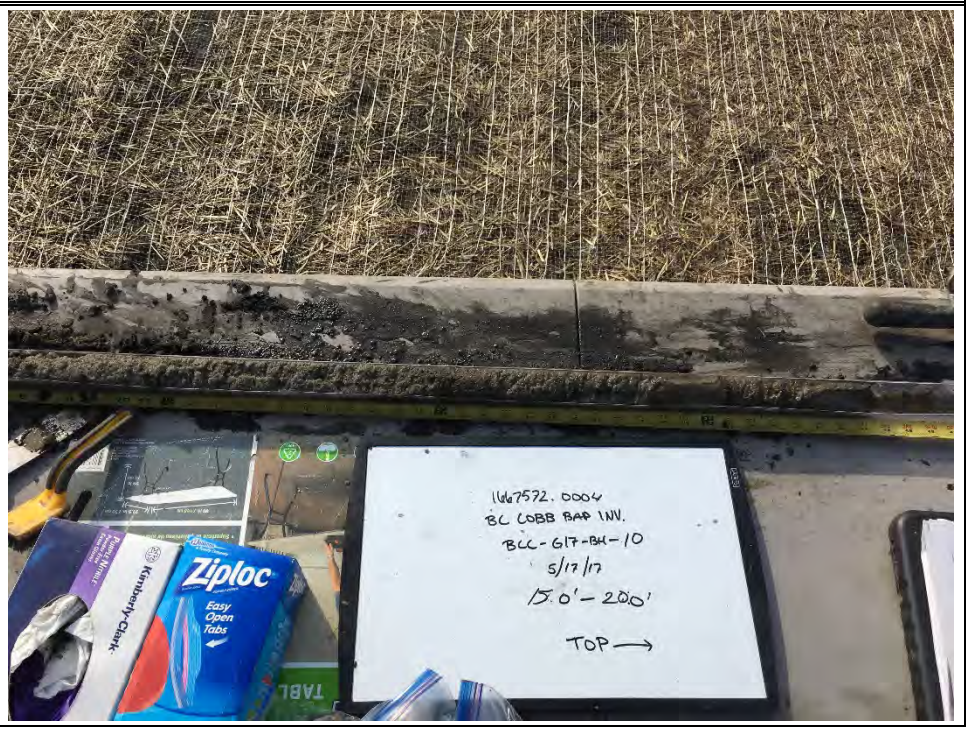


Figure 6 – Site-Specific Calibration Curve for Colorimetric Analysis



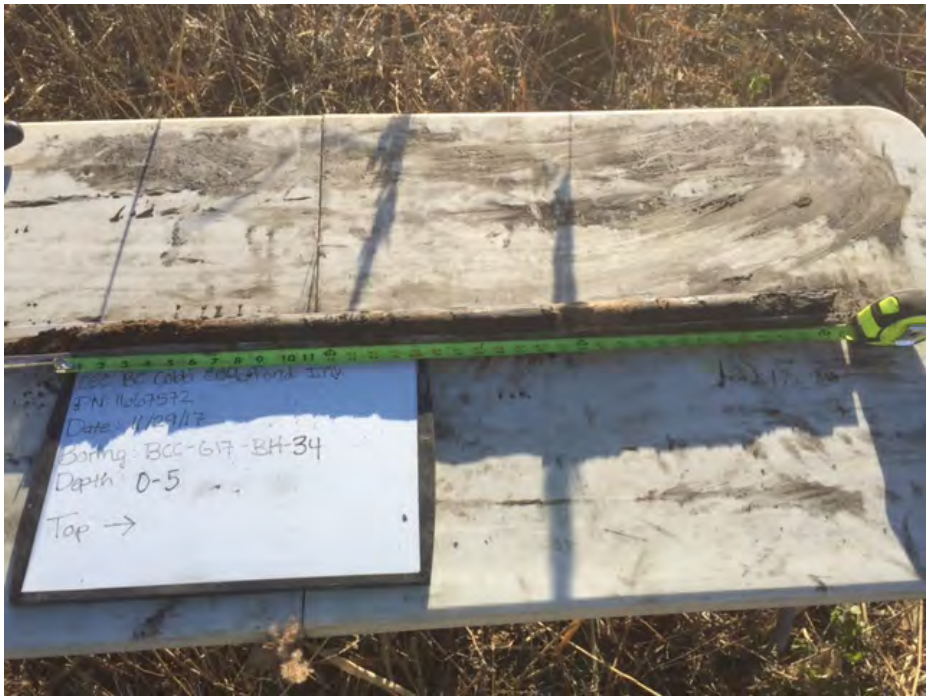
APPENDIX A
SITE BORING PHOTOGRAPHS

PHOTOGRAPH 1 B.C. Cobb Bottom Ash Pond BCC-G17-BH-10: 5.0 – 10.0 ft	
PHOTOGRAPH 2 B.C. Cobb Bottom Ash Pond BCC-G17-BH-10: 10.0 – 15.0 ft	

PHOTOGRAPH 3 B.C. Cobb Bottom Ash Pond BCC-G17-BH-10: 14.0 – 15.0 ft (CCR-Native Soil Contact)	
PHOTOGRAPH 4 B.C. Cobb Bottom Ash Pond BCC-G17-BH-10: 15.0 – 20.0 ft	

PHOTOGRAPH 5 B.C. Cobb Ponds 0-8 BCC-G15-BH-17: 0.0 – 2.0 ft	
PHOTOGRAPH 6 B.C. Cobb Ponds 0-8 BCC-G15-BH-17: 2.0 – 3.0 ft	

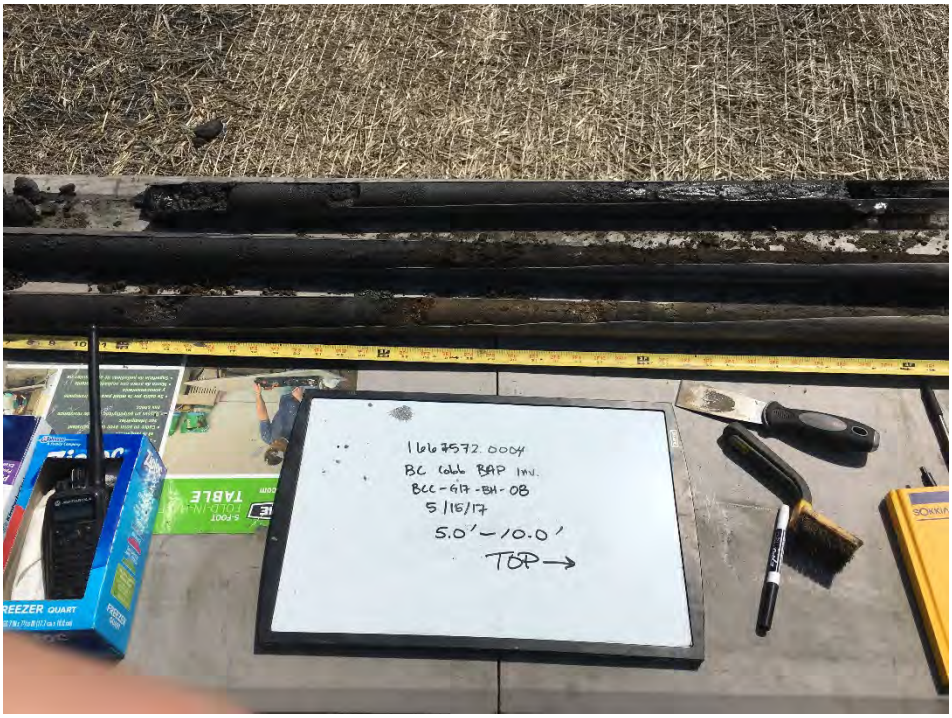
PHOTOGRAPH 7 B.C. Cobb Ponds 0-8 BCC-G15-BH-17: 3.0 – 4.0 ft (CCR-Native Soil Contact)	
PHOTOGRAPH 8 B.C. Cobb Ponds 0-8 BCC-G15-BH-17: 4.0 – 5.0 ft	

PHOTOGRAPH 9 B.C. Cobb Interior Berm BCC-G17-BH-34: 0.0 – 5.0 ft	
PHOTOGRAPH 10 B.C. Cobb Interior Berm BCC-G17-BH-34: 5.0 – 10.0 ft	

PHOTOGRAPH 11 B.C. Cobb Interior Berm BCC-G17-BH-34: 6.0 – 7.0 ft (CCR-Native Soil Contact)	
PHOTOGRAPH 12 B.C. Cobb Interior Berm BCC-G17-BH-34: 10.0 – 15.0 ft	

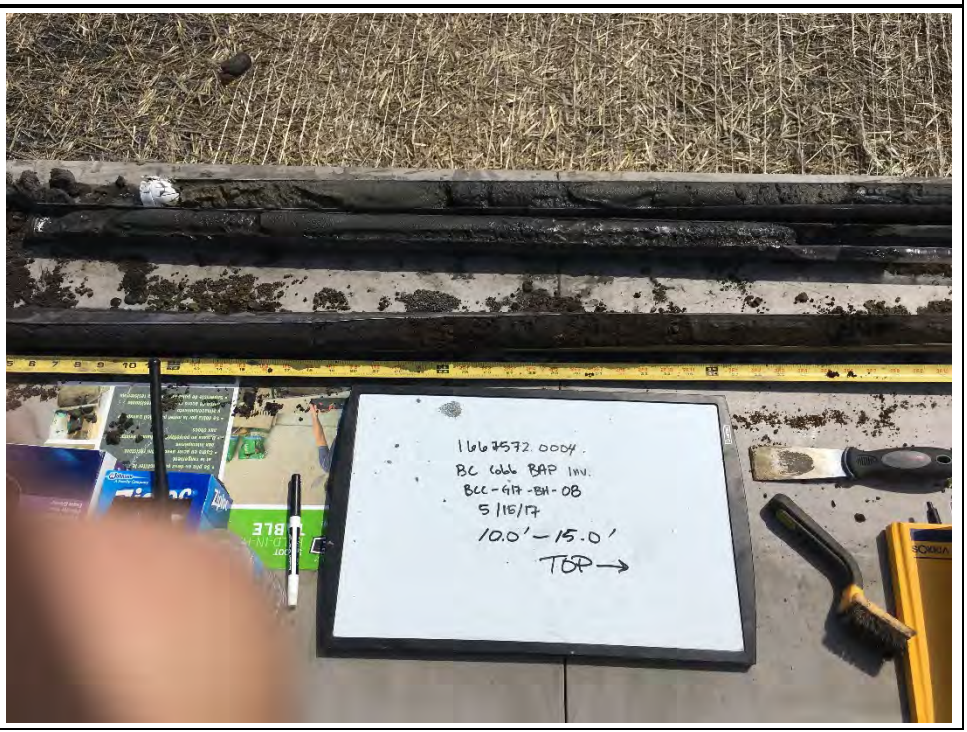
PHOTOGRAPH 13

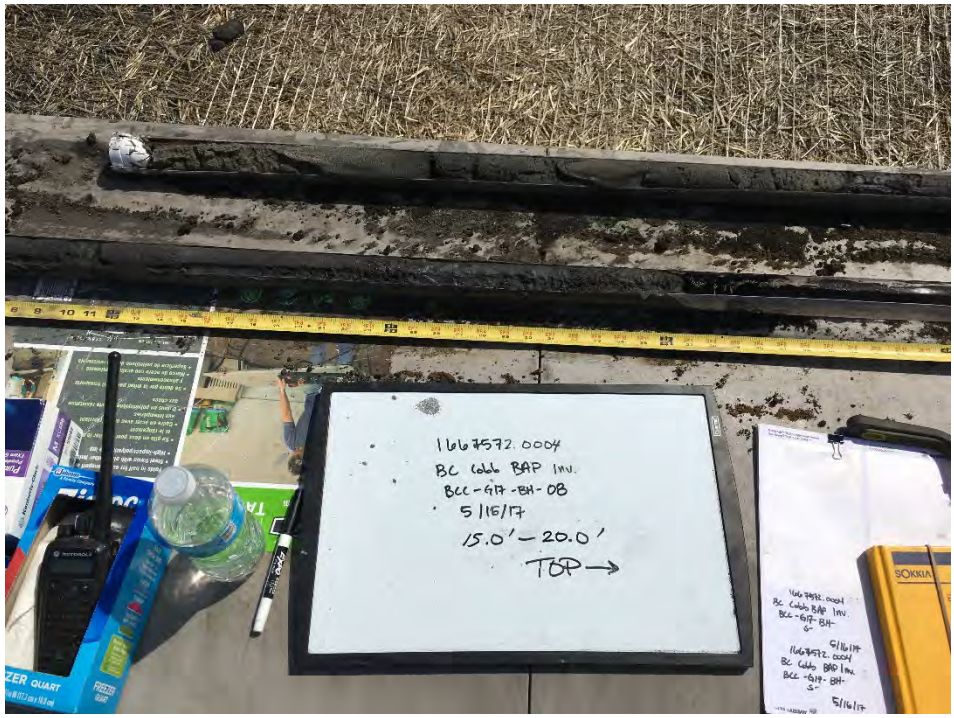
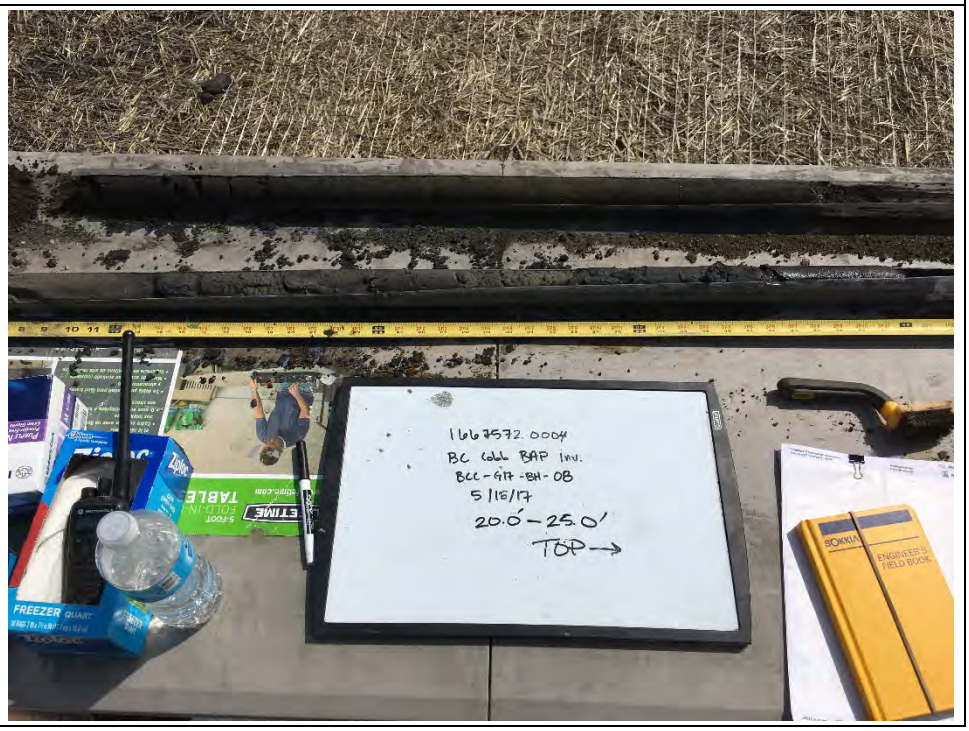
B.C. Cobb
Exterior Berm
BCC-G17-BH-08:
5.0 – 10.0 ft



PHOTOGRAPH 14

B.C. Cobb
Exterior Berm
BCC-G17-BH-08:
10.0 – 15.0 ft



PHOTOGRAPH 15 B.C. Cobb Exterior Berm BCC-G17-BH-08: 15.0 – 20.0 ft	
PHOTOGRAPH 16 B.C. Cobb Exterior Berm BCC-G17-BH-08: 20.0 – 25.0 ft	

PHOTOGRAPH 17

B.C. Cobb
Exterior Berm
BCC-G17-BH-08:
22.0 – 23.0 ft
(CCR-Native Soil
Contact)

APPENDIX B
SOIL BORING LOGS

RECORD OF BOREHOLE BCC-G15-BH-01W

SHEET 1 of 1

PROJECT: BC Cobb Ash Pond
PROJECT NUMBER: 1540973
LOCATION: Pond 4
CLIENT: Consumers Energy Company

DRILLING METHOD: Sonic
DRILLING DATE: 10-12-15
DRILL RIG: Sonic

DATUM: NAVD88
AZIMUTH: ---
NAD83 MI PLANE-S COORDS: N 646664.2, E 12622260

GS ELEVATION (ft): 585.8
TOC ELEVATION: ---

DEPTH (ft)	BORING METHOD	SOIL PROFILE: DESCRIPTION / VEGETATION:	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	RUN: NUMBER	RUN: REC / ATT	SAMPLES: NUMBER	SAMPLES: TYPE	POCKET PENETROMETER (tons/ft²)	LAB TESTS: ENVIRONMENTAL (SPLP & TOTAL METALS)	LAB TESTS: GRAIN SIZE DISTRIBUTION	NOTES WATER LEVELS
0		0.0 - 8.5 WATER.			577.3								
10	Sonic	8.5 - 16.8 (CCR) COAL COMBUSTION RESIDUALS, dark gray, wet, soft to firm.			8.5	1	3.10 5.00	1	SONIC		●	●	
								2	SONIC		●	●	
15						2	5.00 5.00	3A	SONIC		●	●	
					569.0			3B	SONIC		●		
		16.8 - 18.5 ORGANICS, some fine sand, brown, wood debris, wet.			16.8 567.3								
20		18.5 - 26.4 (SP) SAND, poorly graded, fine, brown, wood debris and decomposing organics, non-cohesive, wet.	SP		18.5	3	5.00 5.00	4	SONIC		●	●	
25					559.4	4	5.00 5.00	5	SONIC		●	●	
		26.4 - 31.8 (OL) ORGANIC SANDY SILT, trace to some clay, trace sand, brown, cohesive, wet, firm.	OL		26.4								
30					554.0	5	5.00 5.00						
		31.8 - 33.5 (SP) SAND, poorly graded, fine, brown, non-cohesive, wet.	SP		31.8 552.3								
35		Boring completed at 33.5 ft.											
40		NOTES: 1. Drilled from a barge. 2. Mud line at a depth of 8.5 feet.											

DEPTH SCALE:1 in to 5 ft
DRILLING CONTRACTOR: Ann Arbor Tech Serv.
DRILLER: Jim / Dave

LOGGED: MMJ
CHECKED: JRP
DATE: 11/18/2015

Golder Associates

DUL_BOREHOLE (BC ASH POND) 1540973 BC COBB ASH POND.GPJ DUL.GOLDER.GDT 6/10/16

RECORD OF BOREHOLE BCC-G15-BH-02W

SHEET 1 of 1

PROJECT: BC Cobb Ash Pond
PROJECT NUMBER: 1540973
LOCATION: Pond 3
CLIENT: Consumers Energy Company

DRILLING METHOD: Sonic
DRILLING DATE: 10-12-15
DRILL RIG: Sonic

DATUM: NAVD88
AZIMUTH: ---
NAD83 MI PLANE-S COORDS: N 646804.4, E 12622348

GS ELEVATION (ft): 586.7
TOC ELEVATION: ---

DEPTH (ft)	BORING METHOD	SOIL PROFILE: DESCRIPTION / VEGETATION:	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	RUN: NUMBER	RUN: REC / ATT	SAMPLES: NUMBER	SAMPLES: TYPE	POCKET PENETROMETER (tons/ft²)	LAB TESTS: ENVIRONMENTAL (SPLP & TOTAL METALS)	LAB TESTS: GRAIN SIZE DISTRIBUTION	NOTES WATER LEVELS
0	Sonic	0.0 - 8.3 WATER.			578.4								
5													
10		8.3 - 17.3 (CCR) COAL COMBUSTION RESIDUALS, dark gray, wood debris, wet, soft to firm.			8.3	1	3.80 4.00	1	SONIC		●	●	
15						2	2.10 5.00	2	SONIC		●	●	
		17.3 - 18.9 (SP) SAND, poorly graded, fine, brown, wood debris, non-cohesive, wet.	SP		569.4 17.3 567.8			3	SONIC		●	●	
		18.9 - 19.7 ORGANICS, decomposing, brown, wood debris, wet.			18.9 567.0	3	5.00 5.00	4	SONIC		●	●	
20		19.7 - 27.3 (SP) SAND, poorly graded, fine, brown, wood debris, non-cohesive, wet.	SP		19.7								
25						4	5.00 5.00						
		27.3 - 28.8 ORGANICS, decomposing, brown, peat-like wood debris, wet.			559.4 27.3 557.9			5	SONIC		●	●	
30		28.8 - 32.3 (SM) SILTY SAND, some clay, trace organics, brown, cohesive, wet, firm.	SM		28.8 554.4	5	5.00 5.00						
		Boring completed at 32.3 ft.											
35		NOTES: 1. Drilled from a barge. 2. Mud line at a depth of 8.3 feet.											
40													

DEPTH SCALE:1 in to 5 ft
DRILLING CONTRACTOR: Ann Arbor Tech Serv.
DRILLER: Jim / Dave

LOGGED: MMJ
CHECKED: JRP
DATE: 11/18/2015

Golder Associates

DUL_BOREHOLE (BC ASH POND) 1540973 BC COBB ASH POND.GPJ DUL.GOLDER.GDT 6/10/16

RECORD OF BOREHOLE BCC-G15-BH-03W

SHEET 1 of 1

PROJECT: BC Cobb Ash Pond
PROJECT NUMBER: 1540973
LOCATION: Pond 2
CLIENT: Consumers Energy Company

DRILLING METHOD: Sonic
DRILLING DATE: 10-12-15
DRILL RIG: Sonic

DATUM: NAVD88
AZIMUTH: ---
NAD83 MI PLANE-S COORDS: N 646952.5, E 12622410

GS ELEVATION (ft): 587.2
TOC ELEVATION: ---

DEPTH (ft)	BORING METHOD	SOIL PROFILE: DESCRIPTION / VEGETATION:	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	RUN: NUMBER	RUN: REC / ATT	SAMPLES: NUMBER	SAMPLES: TYPE	POCKET PENETROMETER (tons/ft²)	LAB TESTS: ENVIRONMENTAL (SPLP & TOTAL METALS)	LAB TESTS: GRAIN SIZE DISTRIBUTION	NOTES WATER LEVELS
0	Sonic	0.0 - 8.1 WATER.			579.1								
10		8.1 - 10.6 (CCR) COAL COMBUSTION RESIDUALS, dark gray, wet, soft to firm.			8.1 576.6	1	3.60 4.00	1A 1	SONIC SONIC		● ●	● ●	
15		10.6 - 17.1 (SP) SAND, poorly graded, fine, brown, non-cohesive, wet.	SP		10.6 570.1	2 3	2.50 3.00 5.00 5.00	1B 2 3	SONIC SONIC SONIC		● ● ●	● ● ●	
20		17.1 - 18.1 ORGANICS, decomposing, brown, wood debris, wet. 18.1 - 24.8 (SP) SAND, poorly graded, fine, brown, non-cohesive, wet.	SP		17.1 569.1 18.1 562.4	4	5.00 5.00						
25		24.8 - 30.1 (SM) SILTY SAND, fine, trace to some clay, brown to black, cohesive, wet, stiff.	SM		24.8 557.1	5	5.00 5.00	4 5	SONIC SONIC		● ●	● ●	
30		Boring completed at 30.1 ft. NOTES: 1. Drilled from a barge. 2. Mud line at a depth of 8.1 feet.											
35													
40													

DEPTH SCALE:1 in to 5 ft
DRILLING CONTRACTOR: Ann Arbor Tech Serv.
DRILLER: Jim / Dave

LOGGED: MMJ
CHECKED: JRP
DATE: 11/18/2015

Golder Associates

DUL_BOREHOLE (BC ASH POND) 1540973 BC COBB ASH POND.GPJ DUL.GOLDER.GDT 6/10/16

RECORD OF BOREHOLE BCC-G15-BH-04W

SHEET 1 of 1

PROJECT: BC Cobb Ash Pond
PROJECT NUMBER: 1540973
LOCATION: Pond 1
CLIENT: Consumers Energy Company

DRILLING METHOD: Sonic
DRILLING DATE: 10-6-15
DRILL RIG: Sonic

DATUM: NAVD88
AZIMUTH: ---
NAD83 MI PLANE-S COORDS: N 647066.6, E 12622525

GS ELEVATION (ft): 587.3
TOC ELEVATION: ---

DEPTH (ft)	BORING METHOD	SOIL PROFILE: DESCRIPTION / VEGETATION:	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	RUN: NUMBER	RUN: REC / ATT	SAMPLES: NUMBER	SAMPLES: TYPE	POCKET PENETROMETER (tons/ft²)	LAB TESTS: ENVIRONMENTAL (SPLP & TOTAL METALS)	LAB TESTS: GRAIN SIZE DISTRIBUTION	NOTES WATER LEVELS
0		0.0 - 9.6 WATER.			577.7								
10	Sonic	9.6 - 14.6 (CCR) COAL COMBUSTION RESIDUALS, some silt, dark gray to brown, wood debris, wet, soft to firm.			9.6 572.7	1	4.50 5.00	1 2	SONIC SONIC		● ●	● ●	
15		14.6 - 19.6 No recovery, assumed to be CCR.			14.6 567.7	2	0.00 5.00						
20		19.6 - 22.1 (CCR) COAL COMBUSTION RESIDUALS, some silt, dark gray to brown, wood debris, wet, soft to firm.			19.6 565.2	3	4.20 5.00	3	SONIC		●	●	
25		22.1 - 26.6 (SP) SAND, poorly graded, fine, trace silt, brown, wood debris, non-cohesive, wet.	SP		22.1 560.7								
		26.6 - 28.1 (SP) SAND, poorly graded, coarse, trace gravel, brown, non-cohesive, wet.	SP		26.6 559.2	4	5.00 5.00						
		28.1 - 29.6 (SP) SAND, poorly graded, fine, trace silt, brown, non-cohesive, wet.	SP		28.1 557.7			4 5	SONIC SONIC		● ●	● ●	
30		29.6 - 31.6 (OL) ORGANIC SILTY SAND, brown, wood debris, cohesive, wet.	OL		29.6 555.7								
		31.6 - 34.6 (SP) SAND, poorly graded, fine, brown, non-cohesive, wet.	SP		31.6 552.7	5	5.00 5.00						
35		Boring completed at 34.6 ft.											
40		NOTES: 1. Drilled from a barge. 2. Mud line at a depth of 9.6 feet.											

DEPTH SCALE:1 in to 5 ft
DRILLING CONTRACTOR: Ann Arbor Tech Serv.
DRILLER: Jim / Dave

LOGGED: MMJ
CHECKED: JRP
DATE: 11/18/2015

Golder Associates

DUL_BOREHOLE (BC ASH POND) 1540973 BC COBB ASH POND.GPJ DUL.GOLDER.GDT 6/10/16

RECORD OF BOREHOLE BCC-G15-BH-05W

SHEET 1 of 1

PROJECT: BC Cobb Ash Pond
PROJECT NUMBER: 1540973
LOCATION: Pond 0
CLIENT: Consumers Energy Company

DRILLING METHOD: Sonic
DRILLING DATE: 10-6-15
DRILL RIG: Sonic

DATUM: NAVD88
AZIMUTH: ---
NAD83 MI PLANE-S COORDS: N 647293.5, E 12622650

GS ELEVATION (ft): 587.3
TOC ELEVATION: ---

DEPTH (ft)	BORING METHOD	SOIL PROFILE: DESCRIPTION	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	RUN: NUMBER	RUN: REC / ATT	SAMPLES: NUMBER	SAMPLES: TYPE	POCKET PENETROMETER (tons/ft²)	LAB TESTS: ENVIRONMENTAL (SPLP & TOTAL METALS)	LAB TESTS: GRAIN SIZE DISTRIBUTION	NOTES WATER LEVELS
0	Sonic	VEGETATION: 0.0 - 9.8 WATER.			577.5								
10		9.8 - 10.8 (OL) ORGANIC SILT, trace sand, brown, wood debris, cohesive, wet.	OL		9.8 576.5			1	SONIC		●	●	
		10.8 - 17.8 (SP) SAND, poorly graded, medium, brown, non-cohesive, wet.	SP		10.8	1	4.50 5.00						
15						2	3.00 3.00	2	SONIC		●	●	
					569.5								
20		Boring completed at 17.8 ft. NOTES: 1. Drilled from a barge. 2. Mud line at a depth of 9.8 feet.											
25													
30													
35													
40													

DEPTH SCALE:1 in to 5 ft
DRILLING CONTRACTOR: Ann Arbor Tech Serv.
DRILLER: Jim / Dave

LOGGED: MMJ
CHECKED: JRP
DATE: 11/18/2015

Golder Associates

DUL_BOREHOLE (BC ASH POND) 1540973 BC COBB ASH POND.GPJ DUL.GOLDER.GDT 6/10/16

RECORD OF BOREHOLE BCC-G15-BH-06

SHEET 1 of 1

PROJECT: BC Cobb Ash Pond
PROJECT NUMBER: 1540973
LOCATION: Exterior Berm
CLIENT: Consumers Energy Company

DRILLING METHOD: Sonic
DRILLING DATE: 10-22-15
DRILL RIG: Geo 8140DT

DATUM: NAVD88
AZIMUTH: ---
NAD83 MI PLANE-S COORDS: N 646449.4, E 12622410

GS ELEVATION (ft): 587.6
TOC ELEVATION: ---

DEPTH (ft)	BORING METHOD	SOIL PROFILE: DESCRIPTION / VEGETATION:	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	RUN: NUMBER	RUN: REC / ATT	SAMPLES: NUMBER	SAMPLES: TYPE	POCKET PENETROMETER (tons/ft²)	LAB TESTS: ENVIRONMENTAL (SPLP & TOTAL METALS)	LAB TESTS: GRAIN SIZE DISTRIBUTION	NOTES WATER LEVELS
0	Sonic	0.0 - 20.0 (CCR) COAL COMBUSTION RESIDUALS, trace fine sand, dark gray, wood debris, moist to wet, soft to firm.				1	0.00 8.00	1	GRAB		●	●	
5													
						2	1.50 2.00	2	SONIC		●	●	
10													
15						3	2.00 10.00	3	SONIC		●	●	
20					567.6								
		20.0 - 24.5 (SP) SAND, poorly graded, fine, brown, non-cohesive, wet.	SP		20.0	4	5.00 5.00	4	SONIC		●	●	
					563.1								
25		24.5 - 25.0 (SM) SILTY SAND, fine, brown, non-cohesive, wet.	SM		562.6 25.0	5	5.00 5.00						
		25.0 - 28.0 ORGANICS, some fine sand, brown, peat-like wood debris, organic smell, wet.			559.6								
		28.0 - 29.0 (SP) SAND, poorly graded, fine, brown, non-cohesive, wet.	SP		28.0 558.6								
30		29.0 - 30.0 (OL) ORGANIC SILTY SAND, fine, brown, wet.	OL		29.0 557.6								
		Boring completed at 30.0 ft.											
35													
40													

NOTES:
1. Air vacuumed to 8 feet bgs to confirm no utilities.

DEPTH SCALE:1 in to 5 ft
DRILLING CONTRACTOR: Mateco
DRILLER: Dan/John

LOGGED: MMJ
CHECKED: JRP
DATE: 11/18/2015

Golder Associates

DUL_BOREHOLE (BC ASH POND) 1540973 BC COBB ASH POND.GPJ DUL.GOLDER.GDT 6/10/16

RECORD OF BOREHOLE BCC-G15-BH-07

SHEET 1 of 1

PROJECT: BC Cobb Ash Pond
PROJECT NUMBER: 1540973
LOCATION: Interior Berm
CLIENT: Consumers Energy Company

DRILLING METHOD: Sonic
DRILLING DATE: 10-22-15
DRILL RIG: Geo 8140DT

DATUM: NAVD88
AZIMUTH: ---
NAD83 MI PLANE-S COORDS: N 646707.3, E 12622618

GS ELEVATION (ft): 589.0
TOC ELEVATION: ---

DEPTH (ft)	BORING METHOD	SOIL PROFILE: DESCRIPTION	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	RUN: NUMBER	RUN: REC / ATT	SAMPLES: NUMBER	SAMPLES: TYPE	POCKET PENETROMETER (tons/ft²)	LAB TESTS: ENVIRONMENTAL (SPLP & TOTAL METALS)	LAB TESTS: GRAIN SIZE DISTRIBUTION	NOTES WATER LEVELS
0	Hand Auger	VEGETATION:			586.0								
		0.0 - 3.0 (CCR) COAL COMBUSTION RESIDUALS, medium to coarse, red to brown, partially cemented, moist.				1	5.00 / 5.00	1	AUGER		●	●	
		3.0 - 9.5 (CCR) COAL COMBUSTION RESIDUALS, fine, dark gray, wet, soft to firm.			3.0								
5	Sonic					2	4.80 / 5.00	2	SONIC		●	●	4-inch-thick layer of poorly graded, fine sand
					579.5								
10		9.5 - 15.0 (CCR) COAL COMBUSTION RESIDUALS, with fine to medium sand, dark gray, wet, soft.			9.5	3	2.50 / 5.00	3	SONIC		●	●	
					574.0								
15		15.0 - 26.0 (SP) SAND, poorly graded, fine, brown to gray, wood debris, non-cohesive, wet.	SP		15.0	4	4.80 / 5.00	4	SONIC		●	●	
20						5	5.00 / 5.00						
25					563.0								
		26.0 - 30.0 (OL) ORGANIC SANDY SILT, fine, brown, wood debris, wet, firm.	OL		26.0	6	5.00 / 5.00						
30		Boring completed at 30.0 ft.			559.0								
35													
40													

NOTES:
1. Hand augered to 5 feet bgs to confirm no utilities.

DEPTH SCALE:1 in to 5 ft
DRILLING CONTRACTOR: Mateco
DRILLER: Dan M

LOGGED: MMJ
CHECKED: JRP
DATE: 11/18/2015

Golder Associates

DUL_BOREHOLE (BC ASH POND) 1540973 BC COBB ASH POND.GPJ DUL.GOLDER.GDT 6/10/16

RECORD OF BOREHOLE BCC-G15-BH-08

SHEET 1 of 1

PROJECT: BC Cobb Ash Pond
PROJECT NUMBER: 1540973
LOCATION: Interior Berm
CLIENT: Consumers Energy Company

DRILLING METHOD: Sonic
DRILLING DATE: 10-22-15
DRILL RIG: Geo 8140DT

DATUM: NAVD88
AZIMUTH: ---
NAD83 MI PLANE-S COORDS: N 646976.8, E 12622792

GS ELEVATION (ft): 590.1
TOC ELEVATION: ---

DEPTH (ft)	BORING METHOD	SOIL PROFILE: DESCRIPTION / VEGETATION:	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	RUN: NUMBER	RUN: REC / ATT	SAMPLES: NUMBER	SAMPLES: TYPE	POCKET PENETROMETER (tons/ft²)	LAB TESTS: ENVIRONMENTAL (SPLP & TOTAL METALS)	LAB TESTS: GRAIN SIZE DISTRIBUTION	NOTES WATER LEVELS
0	Hand Auger	0.0 - 5.0 (CCR) COAL COMBUSTION RESIDUALS, fine to medium, black, moist.			585.1	1	5.00 5.00	1	AUGER		●	●	
5	Sonic	5.0 - 8.0 (CCR) COAL COMBUSTION RESIDUALS, some fine sand, dark gray, wood debris, wet, soft to firm.			5.0 582.1	2	5.00 5.00	2 3	SONIC SONIC		● ●	● ●	
		8.0 - 9.0 (SP) SAND, poorly graded, fine to medium, mixed with CCR, dark gray, non-cohesive, wet.	SP		8.0 581.1 580.6								
10		9.0 - 9.5 (CCR) COAL COMBUSTION RESIDUALS, dark gray, wet, firm.	SP		580.1 10.0								
		9.5 - 10.0 (SP) SAND, poorly graded, fine, brown, wood debris, non-cohesive, wet.				3	2.00 5.00						
		10.0 - 17.0 (CCR) COAL COMBUSTION RESIDUALS, dark gray, wet, soft to firm.											
15					573.1								
		17.0 - 19.0 (SP) SAND, poorly graded, fine to medium, brown, non-cohesive, wet.	SP		17.0 571.1	4	5.00 5.00	4	SONIC		●	●	Bottom foot of CCR mixed with wood debris
		19.0 - 20.0 ORGANICS, decomposing, brown, wood debris, wet.			19.0 570.1								
20		20.0 - 21.5 (SW) SAND, fine to coarse, brown, wood debris, shell pieces, non-cohesive, wet.	SW		20.0 568.6								
		21.5 - 30.0 (SP) SAND, poorly graded, fine, brown, wood debris, non-cohesive, wet.			21.5	5	5.00 5.00						
25			SP			6	5.00 5.00						
					560.1								Organic silty sand 3 inches thick
30		Boring completed at 30.0 ft.											
35													
40													

NOTES:
1. Hand augered to 5 feet bgs to confirm no utilities.

DEPTH SCALE:1 in to 5 ft
DRILLING CONTRACTOR: Mateco
DRILLER: Dan M

LOGGED: MMJ
CHECKED: JRP
DATE: 11/18/2015

Golder Associates

DUL_BOREHOLE (BC ASH POND) 1540973 BC COBB ASH POND.GPJ DUL.GOLDER.GDT 6/10/16

RECORD OF BOREHOLE BCC-G15-BH-09W

SHEET 1 of 1

PROJECT: BC Cobb Ash Pond
PROJECT NUMBER: 1540973
LOCATION: Pond 4
CLIENT: Consumers Energy Company

DRILLING METHOD: Sonic
DRILLING DATE: 10-12-15
DRILL RIG: Sonic

DATUM: NAVD88
AZIMUTH: ---
NAD83 MI PLANE-S COORDS: N 646316.5, E 12622812

GS ELEVATION (ft): 585.8
TOC ELEVATION: ---

DEPTH (ft)	BORING METHOD	SOIL PROFILE: DESCRIPTION / VEGETATION:	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	RUN: NUMBER	RUN: REC / ATT	SAMPLES: NUMBER	SAMPLES: TYPE	POCKET PENETROMETER (tons/ft²)	LAB TESTS: ENVIRONMENTAL (SPLP & TOTAL METALS)	LAB TESTS: GRAIN SIZE DISTRIBUTION	NOTES WATER LEVELS
0	Sonic	0.0 - 8.5 WATER.			577.3								
								1	SONIC		●	●	
		8.5 - 11.0 (CCR) COAL COMBUSTION RESIDUALS, dark gray, wet, soft.			8.5	1	2.50 2.50	2	SONIC		●	●	
10					574.8								
		11.0 - 22.3 (SP) SAND, poorly graded, fine to medium, trace to some silt, dark gray to brown, wood debris, organic smell, non-cohesive, wet.			11.0			3	SONIC		●	●	
						2	5.00 5.00	4	SONIC		●	●	
15			SP										
						3	5.00 5.00						
20								5	SONIC			●	
					563.5								
		22.3 - 23.5 ORGANICS, decomposing, brown, wood debris, wet.			22.3 562.3	4	5.00 5.00						
		23.5 - 26.0 (SP) SAND, poorly graded, fine, trace organics, brown, non-cohesive, wet.	SP		23.5								
25					559.8								
		Boring completed at 26.0 ft.											

NOTES:
1. Drilled from a barge.
2. Mud line at a depth of 8.5 feet.

DEPTH SCALE:1 in to 5 ft
DRILLING CONTRACTOR: Ann Arbor Tech Serv.
DRILLER: Jim / Dave

LOGGED: MMJ
CHECKED: JRP
DATE: 11/18/2015

Golder Associates

DUL_BOREHOLE (BC ASH POND) 1540973 BC COBB ASH POND.GPJ DUL.GOLDER.GDT 6/10/16

RECORD OF BOREHOLE BCC-G15-BH-10W

SHEET 1 of 1

PROJECT: BC Cobb Ash Pond
PROJECT NUMBER: 1540973
LOCATION: Pond 3
CLIENT: Consumers Energy Company

DRILLING METHOD: Sonic
DRILLING DATE: 10-12-15
DRILL RIG: Sonic

DATUM: NAVD88
AZIMUTH: ---
NAD83 MI PLANE-S COORDS: N 646439.2, E 12622871

GS ELEVATION (ft): 586.7
TOC ELEVATION: ---

DEPTH (ft)	BORING METHOD	SOIL PROFILE: DESCRIPTION / VEGETATION:	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	RUN: NUMBER	RUN: REC / ATT	SAMPLES: NUMBER	SAMPLES: TYPE	POCKET PENETROMETER (tons/ft²)	LAB TESTS: ENVIRONMENTAL (SPLP & TOTAL METALS)	LAB TESTS: GRAIN SIZE DISTRIBUTION	NOTES WATER LEVELS
0	Sonic	0.0 - 6.9 WATER.			579.8								
		6.9 - 10.4 (CCR) COAL COMBUSTION RESIDUALS, dark gray, wet, soft.			6.9	1	3.80 4.00	1	SONIC		●	●	
10					576.3			2	SONIC		●	●	
								3	SONIC		●	●	
		10.4 - 23.1 (SP) SAND, poorly graded, fine, brown, organic smell, non-cohesive, wet.	SP		10.4	2	4.00 5.00						
15						3	5.00 5.00						
20					563.6	4	5.00 5.00						
		23.1 - 26.4 (SP) SAND, poorly graded, fine, some silt and clay, brown, non-cohesive, wet.	SP		23.1			4	SONIC		●	●	
25					560.3			5	SONIC		●	●	
		26.4 - 30.9 (SM) SILTY SAND, fine, trace clay, brown, trace wood debris, cohesive, wet, firm to stiff.	SM		26.4	5	5.00 5.00						
30					555.8								
		Boring completed at 30.9 ft.											
35		NOTES: 1. Drilled from a barge. 2. Mud line at a depth of 6.9 feet.											
40													

DEPTH SCALE:1 in to 5 ft
DRILLING CONTRACTOR: Ann Arbor Tech Serv.
DRILLER: Jim / Dave

LOGGED: MMJ
CHECKED: JRP
DATE: 11/18/2015

Golder Associates

DUL_BOREHOLE (BC ASH POND) 1540973 BC COBB ASH POND.GPJ DUL.GOLDER.GDT 6/10/16

RECORD OF BOREHOLE BCC-G15-BH-11W

SHEET 1 of 1

PROJECT: BC Cobb Ash Pond
PROJECT NUMBER: 1540973
LOCATION: Pond 2
CLIENT: Consumers Energy Company

DRILLING METHOD: Sonic
DRILLING DATE: 10-13-15
DRILL RIG: Sonic

DATUM: NAVD88
AZIMUTH: ---
NAD83 MI PLANE-S COORDS: N 646564.7, E 12622964

GS ELEVATION (ft): 587.2
TOC ELEVATION: ---

DEPTH (ft)	BORING METHOD	SOIL PROFILE: DESCRIPTION / VEGETATION:	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	RUN: NUMBER	RUN: REC / ATT	SAMPLES: NUMBER	SAMPLES: TYPE	POCKET PENETROMETER (tons/ft²)	LAB TESTS: ENVIRONMENTAL (SPLP & TOTAL METALS)	LAB TESTS: GRAIN SIZE DISTRIBUTION	NOTES WATER LEVELS
0	Sonic	0.0 - 7.3 WATER.			579.9								
		7.3 - 10.1 (CCR) COAL COMBUSTION RESIDUALS, dark gray, wet, soft to firm.			7.3 577.1	1	3.40 3.50	1	SONIC		●	●	
10		10.1 - 23.8 (SP) SAND, poorly graded, fine, brown, wood debris, wet.	SP		10.1			2	SONIC		●	●	
						2	5.00 5.00	3	SONIC		●	●	
15													
						3	5.00 5.00	4	SONIC		●	●	
20								5	SONIC		●	●	
						4	1.50 5.00						
					563.4								
25		23.8 - 25.8 (CL) CLAY, assumed (see NOTES below).	CL		23.8 561.4								
		Boring completed at 25.8 ft.											
30													
35													
40													

NOTES:
1. Drilled from a barge.
2. Mud line at a depth of 7.3 feet.
3. At 23.8 feet, drillers noticed a change in material consistency while sampling (more difficult to drive sampler). The drilelrs suspected organic silt/clay. The sample was lost during recovery.

DEPTH SCALE:1 in to 5 ft
DRILLING CONTRACTOR: Ann Arbor Tech Serv.
DRILLER: Jim / Dave

LOGGED: MMJ
CHECKED: JRP
DATE: 11/18/2015

Golder Associates

DUL_BOREHOLE (BC ASH POND) 1540973 BC COBB ASH POND.GPJ DUL.GOLDER.GDT 6/10/16

RECORD OF BOREHOLE BCC-G15-BH-12W

SHEET 1 of 1

PROJECT: BC Cobb Ash Pond
PROJECT NUMBER: 1540973
LOCATION: Pond 1
CLIENT: Consumers Energy Company

DRILLING METHOD: Sonic
DRILLING DATE: 10-6-15
DRILL RIG: Sonic

DATUM: NAVD88
AZIMUTH: ---
NAD83 MI PLANE-S COORDS: N 646715.7, E 12623058

GS ELEVATION (ft): 587.3
TOC ELEVATION: ---

DEPTH (ft)	BORING METHOD	SOIL PROFILE: DESCRIPTION / VEGETATION:	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	RUN: NUMBER	RUN: REC / ATT	SAMPLES: NUMBER	SAMPLES: TYPE	POCKET PENETROMETER (tons/ft²)	LAB TESTS: ENVIRONMENTAL (SPLP & TOTAL METALS)	LAB TESTS: GRAIN SIZE DISTRIBUTION	NOTES WATER LEVELS
0	Sonic	0.0 - 6.4 WATER.			580.9								
5		6.4 - 15.9 (CCR) COAL COMBUSTION RESIDUALS, some organics, dark gray, wet, soft to firm.			6.4	1	2.00 5.00	1	SONIC		●	●	
10						2	5.00 5.00	2	SONIC		●	●	
15					571.4								
		15.9 - 27.9 (SP) SAND, poorly graded, fine, trace organics, dark greenish gray, non-cohesive, wet.	SP		15.9	3	4.00 5.00	3	SONIC		●	●	
20						4	3.20 5.00						
25					559.4	5	5.00 5.00						
		27.9 - 31.4 (OL) ORGANIC SILTY SAND, brown, wood debris, cohesive, wet.	OL		27.9			4	SONIC		●	●	
30					555.9								
		Boring completed at 31.4 ft.											
35		NOTES: 1. Drilled from a barge. 2. Mud line at a depth of 6.4 feet.											
40													

DEPTH SCALE:1 in to 5 ft
DRILLING CONTRACTOR: Ann Arbor Tech Serv.
DRILLER: Jim / Dave

LOGGED: MMJ
CHECKED: JRP
DATE: 11/18/2015

Golder Associates

DUL_BOREHOLE (BC ASH POND) 1540973 BC COBB ASH POND.GPJ DUL.GOLDER.GDT 6/10/16

PROJECT: BC Cobb Ash Pond
PROJECT NUMBER: 1540973
LOCATION: Pond 0
CLIENT: Consumers Energy Company

RECORD OF BOREHOLE BCC-G15-BH-13W

SHEET 1 of 1

DRILLING METHOD: Sonic
DRILLING DATE: 10-5-15
DRILL RIG: Sonic

DATUM: NAVD88
AZIMUTH: ---
NAD83 MI PLANE-S COORDS: N 646823.3, E 12623138

GS ELEVATION (ft): 587.3
TOC ELEVATION: ---

DEPTH (ft)	BORING METHOD	SOIL PROFILE: DESCRIPTION / VEGETATION:	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	RUN: NUMBER	RUN: REC / ATT	SAMPLES: NUMBER	SAMPLES: TYPE	POCKET PENETROMETER (tons/ft²)	LAB TESTS: ENVIRONMENTAL (SPLP & TOTAL METALS)	LAB TESTS: GRAIN SIZE DISTRIBUTION	NOTES WATER LEVELS
0	Sonic	0.0 - 10.7 WATER.			576.6								
10		10.7 - 13.7 (CCR) COAL COMBUSTION RESIDUALS, dark gray, wet, firm.			10.7 573.6	1	4.20 5.00	1	SONIC		●	●	
15		13.7 - 15.7 (CCR) COAL COMBUSTION RESIDUALS, mixed with fine sand, dark gray, wood debris, organic smell, wet.			13.7 571.6			1A	SONIC		●		
20		15.7 - 22.7 (SP) SAND, poorly graded, fine, trace silt, dark gray to brown, wood debris, organic smell, non-cohesive, wet.	SP		15.7	2	5.00 5.00	2	SONIC		●	●	
					564.6	3	5.00 5.00	3	SONIC		●	●	
25		22.7 - 24.7 (OL) ORGANIC SANDY SILT, dark brown, trace wood debris, organic smell, cohesive, wet, soft.	OL		22.7 562.6								
		24.7 - 25.7 (SP) SAND, poorly graded, fine, brown, non-cohesive, wet.	SP		24.7 561.6								
30		Boring completed at 25.7 ft.											
35		NOTES: 1. Drilled from a barge. 2. Mud line at a depth of 10.7 feet.											
40													

DEPTH SCALE:1 in to 5 ft
DRILLING CONTRACTOR: Ann Arbor Tech Serv.
DRILLER: Jim / Dave

LOGGED: JRP
CHECKED: JRP
DATE: 11/18/2015

Golder Associates

DUL_BOREHOLE (BC ASH POND) 1540973 BC COBB ASH POND.GPJ DUL.GOLDER.GDT 6/10/16

RECORD OF BOREHOLE BCC-G15-BH-14W

SHEET 1 of 1

PROJECT: BC Cobb Ash Pond
PROJECT NUMBER: 1540973
LOCATION: Pond 8
CLIENT: Consumers Energy Company

DRILLING METHOD: Sonic
DRILLING DATE: 10-9-15
DRILL RIG: Sonic

DATUM: NAVD88
AZIMUTH: ---
NAD83 MI PLANE-S COORDS: N 646232.4, E 12623151

GS ELEVATION (ft): 592.0
TOC ELEVATION: ---

DEPTH (ft)	BORING METHOD	SOIL PROFILE: DESCRIPTION / VEGETATION:	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	RUN: NUMBER	RUN: REC / ATT	SAMPLES: NUMBER	SAMPLES: TYPE	POCKET PENETROMETER (tons/ft²)	LAB TESTS: ENVIRONMENTAL (SPLP & TOTAL METALS)	LAB TESTS: GRAIN SIZE DISTRIBUTION	NOTES WATER LEVELS
0	Sonic	0.0 - 5.8 WATER.			586.2								
5		5.8 - 14.7 (CCR) COAL COMBUSTION RESIDUALS, some sand, light gray to dark gray, partially cemented, wood debris at bottom, wet. Drillers observed increased difficulty driving sampler into material.			5.8	1	4.50 5.00	1 2	SONIC SONIC		● ●	● ●	
10						2	4.70 5.00	3	SONIC		●	●	
15		14.7 - 25.8 (SP) SAND, poorly graded, fine, brown, wet.	SP		577.3 14.7	3	5.00 5.00	4	SONIC		●	●	
20						4	3.00 5.00						
25					566.2								
		Boring completed at 25.8 ft. NOTES: 1. Auger refusal at 25.8 feet. 2. Drilled from a barge. 3. Mud line at 5.8 feet.											
30													
35													
40													

DEPTH SCALE:1 in to 5 ft
DRILLING CONTRACTOR: Ann Arbor Tech Serv.
DRILLER: Jim / Dave

LOGGED: MMJ
CHECKED: JRP
DATE: 11/18/2015

Golder Associates

DUL_BOREHOLE (BC ASH POND) 1540973 BC COBB ASH POND.GPJ DUL.GOLDER.GDT 6/10/16

RECORD OF BOREHOLE BCC-G15-BH-15W

SHEET 1 of 1

PROJECT: BC Cobb Ash Pond
PROJECT NUMBER: 1540973
LOCATION: Pond 7
CLIENT: Consumers Energy Company

DRILLING METHOD: Sonic
DRILLING DATE: 10-8-15
DRILL RIG: Sonic

DATUM: NAVD88
AZIMUTH: ---
NAD83 MI PLANE-S COORDS: N 646401.7, E 12623240

GS ELEVATION (ft): 592.0
TOC ELEVATION: ---

DEPTH (ft)	BORING METHOD	SOIL PROFILE: DESCRIPTION	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	RUN: NUMBER	RUN: REC / ATT	SAMPLES: NUMBER	SAMPLES: TYPE	POCKET PENETROMETER (tons/ft²)	LAB TESTS: ENVIRONMENTAL (SPLP & TOTAL METALS)	LAB TESTS: GRAIN SIZE DISTRIBUTION	NOTES WATER LEVELS
0		VEGETATION:											
		0.0 - 10.3 WATER.			581.7								
10	Sonic	10.3 - 17.3 (CCR) COAL COMBUSTION RESIDUALS, dark gray, behaves as a slurry in upper 5 feet, wet, soft.			10.3	1	4.80 5.00	1	SONIC		●	●	
15					574.7			4	SONIC		●	●	
		17.3 - 30.3 (SP) SAND, poorly graded, fine, brown, wood debris, non-cohesive, wet.	SP		17.3	2	3.00 5.00	2	SONIC			●	
20								3	SONIC		●	●	
						3	4.80 5.00						
25						4	4.60 5.00						
30					561.7								
		Boring completed at 30.3 ft.											
35		NOTES: 1. Auger refusal at 30.3 feet. 2. Drilled from a barge. 3. Mud line at 10.3 feet.											
40													

DEPTH SCALE:1 in to 5 ft
DRILLING CONTRACTOR: Ann Arbor Tech Serv.
DRILLER: Jim / Dave

LOGGED: MMJ
CHECKED: JRP
DATE: 11/18/2015

Golder Associates

DUL_BOREHOLE (BC ASH POND) 1540973 BC COBB ASH POND.GPJ DUL.GOLDER.GDT 6/10/16

RECORD OF BOREHOLE BCC-G15-BH-16W

SHEET 1 of 1

PROJECT: BC Cobb Ash Pond
PROJECT NUMBER: 1540973
LOCATION: Pond 6
CLIENT: Consumers Energy Company

DRILLING METHOD: Sonic
DRILLING DATE: 10-8-15
DRILL RIG: Sonic

DATUM: NAVD88
AZIMUTH: ---
NAD83 MI PLANE-S COORDS: N 646488.6, E 12623269

GS ELEVATION (ft): 588.0
TOC ELEVATION: ---

DEPTH (ft)	BORING METHOD	SOIL PROFILE: DESCRIPTION / VEGETATION:	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	RUN: NUMBER	RUN: REC / ATT	SAMPLES: NUMBER	SAMPLES: TYPE	POCKET PENETROMETER (tons/ft²)	LAB TESTS: ENVIRONMENTAL (SPLP & TOTAL METALS)	LAB TESTS: GRAIN SIZE DISTRIBUTION	NOTES WATER LEVELS
0	Sonic	0.0 - 8.1 WATER.			579.9								
10		8.1 - 15.2 (CCR) COAL COMBUSTION RESIDUALS, dark gray, behaves as a slurry in upper 5 feet, wet, very soft.			8.1 572.8	1	0.00 5.00	1	SONIC		●		
15						2	4.10 5.00	2 3	SONIC SONIC		● ●	● ●	
20		15.2 - 27.1 (SP) SAND, poorly graded, fine, brown, wood debris, non-cohesive, wet.	SP		15.2	3	5.00 5.00	4	SONIC			●	
25						4	5.00 5.00						
		27.1 - 28.1 (ML-SM) SANDY SILT, brown, wood debris, organic smell, cohesive, wet, firm.	ML-SM		560.9 27.1 559.9								
30		Boring completed at 28.1 ft. NOTES: 1. Drilled from a barge. 2. Mud line at 8.1 feet.											
35													
40													

DEPTH SCALE:1 in to 5 ft
DRILLING CONTRACTOR: Ann Arbor Tech Serv.
DRILLER: Jim / Dave

LOGGED: MMJ
CHECKED: JRP
DATE: 11/18/2015

Golder Associates

DUL_BOREHOLE (BC ASH POND) 1540973 BC COBB ASH POND.GPJ DUL.GOLDER.GDT 6/10/16

RECORD OF BOREHOLE BCC-G15-BH-17W

SHEET 1 of 1

PROJECT: BC Cobb Ash Pond
PROJECT NUMBER: 1540973
LOCATION: Pond 5
CLIENT: Consumers Energy Company

DRILLING METHOD: Sonic
DRILLING DATE: 10-7-15
DRILL RIG: Sonic

DATUM: NAVD88
AZIMUTH: ---
NAD83 MI PLANE-S COORDS: N 646582, E 12623329

GS ELEVATION (ft): 587.5
TOC ELEVATION: ---

DEPTH (ft)	BORING METHOD	SOIL PROFILE: DESCRIPTION	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	RUN: NUMBER	RUN: REC / ATT	SAMPLES: NUMBER	SAMPLES: TYPE	POCKET PENETROMETER (tons/ft²)	LAB TESTS: ENVIRONMENTAL (SPLP & TOTAL METALS)	LAB TESTS: GRAIN SIZE DISTRIBUTION	NOTES WATER LEVELS
0	Sonic	VEGETATION:			577.3								
		0.0 - 10.2 WATER.											
10		10.2 - 13.7 (CCR) COAL COMBUSTION RESIDUALS, dark gray, wet, soft.			10.2 573.8	1	4.50 5.00	1 1A	SONIC SONIC		● ●	● 	
15		13.7 - 20.2 (SP) SAND, poorly graded, fine, brown, non-cohesive, wet.	SP		13.7 567.3	2	5.00 5.00	4	SONIC			●	
20		20.2 - 23.7 (SM) SILTY SAND, brown, cohesive, wet, stiff.	SM		20.2 563.8	3	5.00 5.00	2	SONIC		●	●	
25		23.7 - 30.2 (SP) SAND, poorly graded, fine, brown, non-cohesive, wet.	SP		23.7 557.3	4	6.00 6.00						
30		30.2 - 31.2 (SM) SILTY SAND, fine, trace clay, brown, cohesive, wet, stiff.	SM		30.2 556.3			3	SONIC		●	●	
		Boring completed at 31.2 ft.											
35		NOTES: 1. Drilled from a barge. 2. Mud line at 10.2 feet.											
40													

DEPTH SCALE:1 in to 5 ft
DRILLING CONTRACTOR: Ann Arbor Tech Serv.
DRILLER: Jim / Dave

LOGGED: MMJ
CHECKED: JRP
DATE: 11/18/2015

Golder Associates

DUL_BOREHOLE (BC ASH POND) 1540973 BC COBB ASH POND.GPJ DUL.GOLDER.GDT 6/10/16

RECORD OF BOREHOLE BCC-G15-BH-18W

SHEET 1 of 1

PROJECT: BC Cobb Ash Pond
PROJECT NUMBER: 1540973
LOCATION: Pond 7
CLIENT: Consumers Energy Company

DRILLING METHOD: Sonic
DRILLING DATE: 10-9-15
DRILL RIG: Sonic

DATUM: NAVD88
AZIMUTH: ---
NAD83 MI PLANE-S COORDS: N 646227.8, E 12623359

GS ELEVATION (ft): 592.0
TOC ELEVATION: ---

DEPTH (ft)	BORING METHOD	SOIL PROFILE: DESCRIPTION / VEGETATION:	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	RUN: NUMBER	RUN: REC / ATT	SAMPLES: NUMBER	SAMPLES: TYPE	POCKET PENETROMETER (tons/ft²)	LAB TESTS: ENVIRONMENTAL (SPLP & TOTAL METALS)	LAB TESTS: GRAIN SIZE DISTRIBUTION	NOTES WATER LEVELS
0	Sonic	0.0 - 4.7 WATER.			587.3								
5		4.7 - 16.5 (CCR) COAL COMBUSTION RESIDUALS, some organics, dark gray, layer of wood debris at base, wet, soft.			4.7	1	5.00 / 5.00	1	SONIC		●	●	
10						2	2.90 / 5.00	2	SONIC		●	●	
15					575.5			3	SONIC		●	●	
		16.5 - 29.7 (SP) SAND, poorly graded, fine to medium, dark gray to brown, non-cohesive, wet.	SP		16.5	3	3.90 / 5.00	4	SONIC		●	●	
20						4	2.80 / 5.00	5	SONIC			●	
25						5	0.00 / 5.00						
					562.3								
30		Boring completed at 29.7 ft.											
35		NOTES: 1. Drilled from a barge. 2. Mud line at 4.7 feet.											
40													

DEPTH SCALE:1 in to 5 ft
DRILLING CONTRACTOR: Ann Arbor Tech Serv.
DRILLER: Jim / Dave

LOGGED: MMJ
CHECKED: JRP
DATE: 11/18/2015

Golder Associates

DUL_BOREHOLE (BC ASH POND) 1540973 BC COBB ASH POND.GPJ DUL.GOLDER.GDT 6/10/16

RECORD OF BOREHOLE BCC-G15-BH-19W

SHEET 1 of 1

PROJECT: BC Cobb Ash Pond
PROJECT NUMBER: 1540973
LOCATION: Pond 6
CLIENT: Consumers Energy Company

DRILLING METHOD: Sonic
DRILLING DATE: 10-8-15
DRILL RIG: Sonic

DATUM: NAVD88
AZIMUTH: ---
NAD83 MI PLANE-S COORDS: N 646210.6, E 12623476

GS ELEVATION (ft): 588.0
TOC ELEVATION: ---

DEPTH (ft)	BORING METHOD	SOIL PROFILE: DESCRIPTION / VEGETATION:	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	RUN: NUMBER	RUN: REC / ATT	SAMPLES: NUMBER	SAMPLES: TYPE	POCKET PENETROMETER (tons/ft²)	LAB TESTS: ENVIRONMENTAL (SPLP & TOTAL METALS)	LAB TESTS: GRAIN SIZE DISTRIBUTION	NOTES WATER LEVELS
0	Sonic	0.0 - 5.0 WATER.			583.0								
5		5.0 - 10.0 (CCR) COAL COMBUSTION RESIDUALS, dark gray, wet, soft.			5.0	1	4.80 5.00	1	SONIC		●	●	
								2	SONIC		●	●	
10					578.0			3	SONIC			●	
		10.0 - 20.0 (SP) SAND, poorly graded, fine, brown, wood debris, non-cohesive, wet, compact to dense.	SP		10.0	2	5.00 5.00	4	SONIC			●	
15						3	2.50 5.00						
20		Boring completed at 20.0 ft.			568.0								

NOTES:
1. Auger refusal at 20.0 feet.
2. Drilled from a barge.
3. Mud line at 5.0 feet.

DEPTH SCALE:1 in to 5 ft
DRILLING CONTRACTOR: Ann Arbor Tech Serv.
DRILLER: Jim / Dave

LOGGED: MMJ
CHECKED: JRP
DATE: 11/18/2015

Golder Associates

DUL_BOREHOLE (BC ASH POND) 1540973 BC COBB ASH POND.GPJ DUL.GOLDER.GDT 6/10/16

RECORD OF BOREHOLE BCC-G15-BH-20W

SHEET 1 of 1

PROJECT: BC Cobb Ash Pond
PROJECT NUMBER: 1540973
LOCATION: Pond 5
CLIENT: Consumers Energy Company

DRILLING METHOD: Sonic
DRILLING DATE: 10-7-15
DRILL RIG: Sonic

DATUM: NAVD88
AZIMUTH: ---
NAD83 MI PLANE-S COORDS: N 646222.6, E 12623590

GS ELEVATION (ft): 587.5
TOC ELEVATION: ---

DEPTH (ft)	BORING METHOD	SOIL PROFILE: DESCRIPTION / VEGETATION:	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	RUN: NUMBER	RUN: REC / ATT	SAMPLES: NUMBER	SAMPLES: TYPE	POCKET PENETROMETER (tons/ft²)	LAB TESTS: ENVIRONMENTAL (SPLP & TOTAL METALS)	LAB TESTS: GRAIN SIZE DISTRIBUTION	NOTES WATER LEVELS
0	Sonic	0.0 - 8.6 WATER.			578.9								
		8.6 - 11.6 (CCR) COAL COMBUSTION RESIDUALS, dark gray, wet, soft.			8.6 575.9	1	5.00 5.00	1 1A	SONIC SONIC		● ●	●	
		11.6 - 23.6 (SP) SAND, poorly graded, fine, trace silt, brown, wood debris, non-cohesive, wet, dense.	SP		11.6	2	5.00 5.00	2	SONIC		●	●	
						3	4.50 5.00	3	SONIC			●	
		Boring completed at 23.6 ft.			563.9								

NOTES:
1. Auger refusal at 23.6 feet.
2. Drilled from a barge.
3. Mud line at 8.6 feet.

DEPTH SCALE:1 in to 5 ft
DRILLING CONTRACTOR: Ann Arbor Tech Serv.
DRILLER: Jim / Dave

LOGGED: MMJ
CHECKED: JRP
DATE: 11/18/2015

Golder Associates

DUL_BOREHOLE (BC ASH POND) 1540973 BC COBB ASH POND.GPJ DUL.GOLDER.GDT 6/10/16

RECORD OF BOREHOLE BCC-G15-BH-21W

SHEET 1 of 1

PROJECT: BC Cobb Ash Pond
PROJECT NUMBER: 1540973
LOCATION: EQ Basin
CLIENT: Consumers Energy Company

DRILLING METHOD: Sonic
DRILLING DATE: 10-22-15
DRILL RIG: Geo 8140DT

DATUM: NAVD88
AZIMUTH: ---
NAD83 MI PLANE-S COORDS: N 645691.3, E 12623547

GS ELEVATION (ft): 591.4
TOC ELEVATION: ---

DEPTH (ft)	BORING METHOD	SOIL PROFILE: DESCRIPTION / VEGETATION:	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	RUN: NUMBER	RUN: REC / ATT	SAMPLES: NUMBER	SAMPLES: TYPE	POCKET PENETROMETER (tons/ft²)	LAB TESTS: ENVIRONMENTAL (SPLP & TOTAL METALS)	LAB TESTS: GRAIN SIZE DISTRIBUTION	NOTES WATER LEVELS
0	Sonic	0.0 - 4.5 (CCR) COAL COMBUSTION RESIDUALS, medium to coarse, gray to brown, partially cemented, wet.			586.9	1	4.00/5.00	1	SONIC		●	●	
5		4.5 - 19.0 (CCR) COAL COMBUSTION RESIDUALS, fine, trace gravel and slag, dark gray, wet, firm.			4.5	2	3.50/5.00	2	SONIC		●	●	
10						3	4.50/5.00	3	SONIC		●	●	
15						4	1.00/5.00						
20					572.4								
		19.0 - 19.5 (OL) ORGANIC SILT, brown, peat-like wood debris, wet.	OL		571.9 19.5								
		19.5 - 25.0 (SP) SAND, poorly graded, fine to medium, trace to some organic silt, brown, wood debris, non-cohesive, wet.	SP			5	5.00/5.00	4	SONIC		●	●	
25					566.4								
		Boring completed at 25.0 ft.											
30													
35													
40													

NOTES:
1. Basin drained immediately prior to drilling.

DEPTH SCALE:1 in to 5 ft
DRILLING CONTRACTOR: Mateco
DRILLER: Dan/John

LOGGED: MMJ
CHECKED: JRP
DATE: 11/18/2015

Golder Associates

DUL_BOREHOLE (BC ASH POND) 1540973 BC COBB ASH POND.GPJ DUL.GOLDER.GDT 6/10/16

RECORD OF BOREHOLE BCC-G15-BH-22W

SHEET 1 of 1

PROJECT: BC Cobb Ash Pond
PROJECT NUMBER: 1540973
LOCATION: EQ Basin
CLIENT: Consumers Energy Company

DRILLING METHOD: Sonic
DRILLING DATE: 10-22-15
DRILL RIG: Geo 8140DT

DATUM: NAVD88
AZIMUTH: ---
NAD83 MI PLANE-S COORDS: N 645718.3, E 12623643

GS ELEVATION (ft): 590.5
TOC ELEVATION: ---

DEPTH (ft)	BORING METHOD	SOIL PROFILE: DESCRIPTION	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	RUN: NUMBER	RUN: REC / ATT	SAMPLES: NUMBER	SAMPLES: TYPE	POCKET PENETROMETER (tons/ft²)	LAB TESTS: ENVIRONMENTAL (SPLP & TOTAL METALS)	LAB TESTS: GRAIN SIZE DISTRIBUTION	NOTES WATER LEVELS
0	Sonic	VEGETATION:			586.0								
		0.0 - 4.5 (CCR) COAL COMBUSTION RESIDUALS, medium to coarse, gray to brown, parially cemented, wet.				1	2.80 5.00	1	SONIC		●	●	
5		4.5 - 7.5 (CCR) COAL COMBUSTION RESIDUALS, medium to fine, trace gravel and slag, reddish brown, wet.			4.5 583.0	2	4.60 5.00	2	SONIC		●	●	
		7.5 - 16.5 (CCR) COAL COMBUSTION RESIDUALS, fine, dark gray, wet, firm to soft.			7.5 574.0	3	4.70 5.00	3	SONIC		●	●	
15		16.5 - 17.5 ORGANICS, brown, peat-like wood debris, wet.			16.5 573.0	4	4.50 5.00	4	SONIC		●	●	
		17.5 - 24.5 (SP) SAND, poorly graded, fine, brown, wood debris, wet.	SP		17.5 566.0	5	4.80 5.00						
20		24.5 - 25.0 (OL) ORGANIC SILT, with peat, brown, wood debris, organic smell, wet.	OL		565.5								
25		Boring completed at 25.0 ft.											
30		NOTES: 1. Basin drained immediately prior to drilling.											
35													
40													

DEPTH SCALE:1 in to 5 ft
DRILLING CONTRACTOR: Mateco
DRILLER: Dan/John

LOGGED: MMJ
CHECKED: JRP
DATE: 11/18/2015

Golder Associates

DUL_BOREHOLE (BC ASH POND) 1540973 BC COBB ASH POND.GPJ DUL.GOLDER.GDT 6/10/16

PROJECT: BC Cobb BAP Investigation

RECORD OF BOREHOLE BCC-G17-BH-01

SHEET 1 of 1

PROJECT NUMBER: 1667572.0004
LOCATION: Storage Area
CLIENT: Consumers Energy Company

DRILLING METHOD: GeoProbe
DRILLING DATE: 05-17-17
DRILL RIG: Geo 6620DT

DATUM: NAVD88
AZIMUTH: ---
NAD83 MI PLANE-S COORDS: N 646509.5, E 12622232.1

GS ELEVATION (ft): 586
TOC ELEVATION: ---

DEPTH (ft)	BORING METHOD	SOIL PROFILE: DESCRIPTION / VEGETATION:	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	RUN: NUMBER	RUN: REC / ATT	SAMPLES: NUMBER	SAMPLES: TYPE	POCKET PENETROMETER (tons/ft²)	LAB TESTS: ENVIRONMENTAL (SPLP & TOTAL METALS)	LAB TESTS: GRAIN SIZE DISTRIBUTION	NOTES WATER LEVELS
0	Geoprobe	0.0 - 2.0 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash, medium, black, dry, compact.			584.0			1	GP				
		2.0 - 10.0 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine, dark gray, dry to wet, stiff.			2.0	1	5.00 5.00						
5								2	GP				6 ft ▼
						2	5.00 5.00	3	GP				5.5' soft woody debris
					576.0								
10		10.0 - 13.2 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine, dark gray, wet, soft.			10.0			4	GP				
						3	5.00 5.00	5	GP				
		13.2 - 13.4 (OL) ORGANIC SILT, low plasticity black, decomposing odor, cohesive, wet, soft.	OL		572.9			6	GP				
			SP		13.4								
15		13.4 - 15.0 (SP) SAND and CCR - Fly Ash, poorly graded, fine, gray, trace woody debris, wet.			571.0 15.0			7	GP				
			SP										
		15.0 - 18.0 (SP) SAND, poorly graded, medium to fine, gray, trace organics, wet.			568.0	4	2.60 5.00	8	GP				
		18.0 - 18.8 (OL) ORGANIC SILT, brown, with wood debris, cohesive, wet.	OL		567.3			9	GP				
			SP		18.8								
20		18.8 - 20.0 (SP) SAND, poorly graded, medium to fine, brown, trace organics, wet.			566.0			10	GP				
		Boring completed at 20.0 ft.											
25													
30													
35													
40													
45													

DEPTH SCALE:1 in to 5.6 ft
DRILLING CONTRACTOR: Mateco
DRILLER: Steve/John

LOGGED: JTT
CHECKED: MMJ
DATE: 6/9/2017

Golder Associates

DUL_BOREHOLE (BC ASH POND) 1667572.0004 BC COBB BAP INVESTIGATION.GPJ DUL.GOLDER.GDT 6/12/17

PROJECT: BC Cobb BAP Investigation

RECORD OF BOREHOLE BCC-G17-BH-02

SHEET 1 of 1

PROJECT NUMBER: 1667572.0004
DRILLING METHOD: GeoProbe
DATUM: NAVD88
GS ELEVATION (ft): 584.1

LOCATION: Storage Area
DRILLING DATE: 05-17-17
AZIMUTH: ---
TOC ELEVATION: ---

CLIENT: Consumers Energy Company
DRILL RIG: Geo 6620DT
NAD83 MI PLANE-S COORDS: N 646352.6, E 12622180.3

DEPTH (ft)	BORING METHOD	SOIL PROFILE: DESCRIPTION / VEGETATION:	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	RUN: NUMBER	RUN: REC / ATT	SAMPLES: NUMBER	SAMPLES: TYPE	POCKET PENETROMETER (tons/ft²)	LAB TESTS: ENVIRONMENTAL (SPLP & TOTAL METALS)	LAB TESTS: GRAIN SIZE DISTRIBUTION	NOTES WATER LEVELS
0	Geoprobe	0.0 - 5.0 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash, medium to coarse, black, dry, compact.			579.1	1	4.50 5.00	1	GP				
5		5.0 - 14.2 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine to medium, dark gray, dry to wet.			5.0	2	4.50 5.00	2	GP				6 ft ▼
								3	GP				
10						3	5.00 5.00	4	GP				
								5	GP				
					569.9			6	GP				
15		14.2 - 15.0 (OL) ORGANIC SILT, low plasticity, black, cohesive, wet, soft.	OL		569.1 15.0			7	GP				
		15.0 - 18.0 (SP) SAND, poorly graded, fine, gray, wet.	SP		566.1	4	3.50 5.00	8	GP				16' woody debris
		18.0 - 20.0 (OL) ORGANIC SILT, brown, with wood debris, cohesive, wet.	OL		18.0 564.1								18'-20' wood debris throughout
20		Boring completed at 20.0 ft.						9	GP				
25													
30													
35													
40													
45													

DUL_BOREHOLE (BC ASH POND) 1667572.0004 BC COBB BAP INVESTIGATION.GPJ DUL.GOLDER.GDT 6/12/17

Golder Associates

DEPTH SCALE:1 in to 5.6 ft
DRILLING CONTRACTOR: Mateco
DRILLER: Steve/John

LOGGED: JTT
CHECKED: MMJ
DATE: 6/9/2017

PROJECT: BC Cobb BAP Investigation

RECORD OF BOREHOLE BCC-G17-BH-03

SHEET 1 of 1

PROJECT NUMBER: 1667572.0004
LOCATION: Storage Area
CLIENT: Consumers Energy Company

DRILLING METHOD: GeoProbe
DRILLING DATE: 05-17-17
DRILL RIG: Geo 6620DT

DATUM: NAVD88
AZIMUTH: ---
NAD83 MI PLANE-S COORDS: N 646372.1, E 12622334.5

GS ELEVATION (ft): 584.4
TOC ELEVATION: ---

DEPTH (ft)	BORING METHOD	SOIL PROFILE: DESCRIPTION / VEGETATION:	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	RUN: NUMBER	RUN: REC / ATT	SAMPLES: NUMBER	SAMPLES: TYPE	POCKET PENETROMETER (tons/ft²)	LAB TESTS: ENVIRONMENTAL (SPLP & TOTAL METALS)	LAB TESTS: GRAIN SIZE DISTRIBUTION	NOTES WATER LEVELS
0	Geoprobe	0.0 - 2.0 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash, medium, black, contains unburnt coal, dry.			582.4	1	4.50 5.00	1	GP				
		2.0 - 2.5 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, dark gray, dry, soft.			581.9 581.4 3.0			2 3	GP GP				
5		2.5 - 3.0 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash, medium, black, dry, compact.						4	GP				
		3.0 - 6.5 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine, dark gray, dry to wet, soft.			577.9 6.5	2	5.00 5.00	5	GP				6 ft ▼
		6.5 - 8.5 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash, medium, black, wet.			575.9			6	GP				
10		8.5 - 13.0 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine, dark gray, wet.			8.5			7	GP				
					571.4	3	4.50 5.00	8	GP				
		13.0 - 15.0 (SP) SAND, poorly graded, medium to fine, gray, trace wood debris, wet.	SP		13.0 569.4			9	GP				15' layer of black organic silt
15		Boring completed at 15.0 ft.											
20													
25													
30													
35													
40													
45													

DUL_BOREHOLE (BC ASH POND) 1667572.0004 BC COBB BAP INVESTIGATION.GPJ DUL.GOLDER.GDT 6/12/17

Golder Associates

DEPTH SCALE:1 in to 5.6 ft
DRILLING CONTRACTOR: Mateco
DRILLER: Steve/John

LOGGED: JTT
CHECKED: MMJ
DATE: 6/9/2017

PROJECT: BC Cobb BAP Investigation
PROJECT NUMBER: 1667572.0004
LOCATION: Storage Area
CLIENT: Consumers Energy Company

RECORD OF BOREHOLE BCC-G17-BH-04

SHEET 1 of 1

DRILLING METHOD: GeoProbe
DRILLING DATE: 05-17-17
DRILL RIG: Geo 6620DT

DATUM: NAVD88
AZIMUTH: ---
NAD83 MI PLANE-S COORDS: N 646323.1, E 12622481.6

GS ELEVATION (ft): 585.3
TOC ELEVATION: ---

DEPTH (ft)	BORING METHOD	SOIL PROFILE: DESCRIPTION / VEGETATION:	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	RUN: NUMBER	RUN: REC / ATT	SAMPLES: NUMBER	SAMPLES: TYPE	POCKET PENETROMETER (tons/ft²)	LAB TESTS: ENVIRONMENTAL (SPLP & TOTAL METALS)	LAB TESTS: GRAIN SIZE DISTRIBUTION	NOTES WATER LEVELS
0	Geoprobe	0.0 - 1.5 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash, medium, black, dry.			583.8			1	GP				
		1.5 - 13.0 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine, dark gray, dry to wet, soft.			1.5	1	5.00 5.00	2 3	GP GP				
5						2	5.00 5.00	4 5	GP GP				5 ft ▼
10						3	5.00 5.00	6 7 8	GP GP GP				8.7'-10' contains trace sand
		13.0 - 15.0 (SP) SAND, medium to fine, gray, decomposing odor, wet.	SP		572.3 13.0 570.3								13' interbedded woody debris throughout, black organic silt
15		Boring completed at 15.0 ft.						9	GP				
20													
25													
30													
35													
40													
45													

DUL_BOREHOLE (BC ASH POND) 1667572.0004 BC COBB BAP INVESTIGATION.GPJ DUL.GOLDER.GDT 6/12/17

Golder Associates

DEPTH SCALE:1 in to 5.6 ft
DRILLING CONTRACTOR: Mateco
DRILLER: Steve/John

LOGGED: JTT
CHECKED: MMJ
DATE: 6/9/2017

PROJECT: BC Cobb BAP Investigation

RECORD OF BOREHOLE BCC-G17-BH-05

SHEET 1 of 1

PROJECT NUMBER: 1667572.0004
LOCATION: Storage Area
CLIENT: Consumers Energy Company

DRILLING METHOD: GeoProbe
DRILLING DATE: 05-17-17
DRILL RIG: Geo 6620DT

DATUM: NAVD88
AZIMUTH: ---
NAD83 MI PLANE-S COORDS: N 646272.5, E 12622618.1

GS ELEVATION (ft): 586.5
TOC ELEVATION: ---

DEPTH (ft)	BORING METHOD	SOIL PROFILE: DESCRIPTION / VEGETATION:	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	RUN: NUMBER	RUN: REC / ATT	SAMPLES: NUMBER	SAMPLES: TYPE	POCKET PENETROMETER (tons/ft²)	LAB TESTS: ENVIRONMENTAL (SPLP & TOTAL METALS)	LAB TESTS: GRAIN SIZE DISTRIBUTION	NOTES WATER LEVELS
0	Geoprobe	0.0 - 3.0 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash, coarse, black, trace slag, dry.			583.5	1	4.30 5.00	1	GP				
		3.0 - 4.0 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine, dark gray, dry.			3.0 582.5			2	GP				
5		4.0 - 5.5 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash, medium to coarse, black, moist.			4.0 581.0			3 4	GP GP				5.5 ft ▼
		5.5 - 15.0 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine, dark gray, wet, soft.			5.5	2	5.00 5.00	5	GP				
10								6	GP				
						3	2.60 5.00	7	GP				14.5'-15' Grain size slightly increases
15		15.0 - 18.5 (SP) SAND, poorly graded, fine to medium, black to gray, trace unburnt coal, trace organics, wet.	SP		571.5 15.0 568.0	4	4.00 5.00	8 9	GP GP				15'-16.5' contain a CCR/SAND mixture
		18.5 - 19.0 (OL) ORGANIC SILT, low plasticity brown, with sand, cohesive, wet.	OL SP		567.5 19.0 566.5			10 11	GP GP				18.7' contains woody debris
20		19.0 - 20.0 (SP) SAND, poorly graded, fine to medium, brown to gray, wet.						12	GP				
		Boring completed at 20.0 ft.											
25													
30													
35													
40													
45													

DEPTH SCALE:1 in to 5.6 ft
DRILLING CONTRACTOR: Mateco
DRILLER: Steve/John

LOGGED: JTT
CHECKED: MMJ
DATE: 6/9/2017

Golder Associates

DUL_BOREHOLE (BC ASH POND) 1667572.0004 BC COBB BAP INVESTIGATION.GPJ DUL.GOLDER.GDT 6/12/17

PROJECT: BC Cobb BAP Investigation

RECORD OF BOREHOLE BCC-G17-BH-06

SHEET 1 of 1

PROJECT NUMBER: 1667572.0004
DRILLING METHOD: GeoProbe
DATUM: NAVD88
GS ELEVATION (ft): 594.7

LOCATION: Bottom Ash Pond
DRILLING DATE: 05-16-17
AZIMUTH: ---
TOC ELEVATION: ---

CLIENT: Consumers Energy Company
DRILL RIG: Geo 6620DT
NAD83 MI PLANE-S COORDS: N 645781.7, E 12623379.4

DEPTH (ft)	BORING METHOD	SOIL PROFILE: DESCRIPTION / VEGETATION:	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	RUN: NUMBER	RUN: REC / ATT	SAMPLES: NUMBER	SAMPLES: TYPE	POCKET PENETROMETER (tons/ft²)	LAB TESTS: ENVIRONMENTAL (SPLP & TOTAL METALS)	LAB TESTS: GRAIN SIZE DISTRIBUTION	NOTES WATER LEVELS
0	Air Vacuum	0.0 - 12.8 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash, fine to coarse, dark gray to black, trace slag.				1	5.00	1	GRAB				
5						2	5.00 5.00	2 3	~~GRAB~~ GP				
10								4	GP				
	Geoprobe				581.9	3	3.80 5.00	5	GP				
		12.8 - 13.3 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine, dark gray.			581.4			6 7	GP GP				
15		13.3 - 13.6 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash, medium to coarse, black.			580.2 579.7 15.0			8 9 10	GP GP GP				
		13.6 - 14.0 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine, dark gray.			577.7 17.0	4	3.50 5.00	11	GP				
		14.0 - 14.5 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash, medium to coarse, black.			575.7			12	GP				
20		14.5 - 15.0 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine, dark gray.	OL		575.2 19.5			13 14	GP GP				
		15.0 - 17.0 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash, medium to coarse, black.	SP			5	4.00 5.00						
		17.0 - 19.0 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine, dark gray.											
25		19.0 - 19.5 (OL) ORGANIC SILT, low plasticity, black, cohesive.			569.7								
		19.5 - 25.0 (SP) SAND, poorly graded, fine to medium, gray, trace organic silt.											
30		Boring completed at 25.0 ft.											
35		NOTES: 1. Air vacuumed to 5 feet bgs to confirm no utilities. 2. No water level observed during sampling.											
40													
45													

DUL_BOREHOLE (BC ASH POND) 1667572.0004 BC COBB BAP INVESTIGATION.GPJ DUL.GOLDER.GDT 6/12/17

Golder Associates

DEPTH SCALE:1 in to 5.6 ft
DRILLING CONTRACTOR: Mateco
DRILLER: Steve/Joe

LOGGED: JTT
CHECKED: MMJ
DATE: 6/9/2017

PROJECT: BC Cobb BAP Investigation
PROJECT NUMBER: 1667572.0004
LOCATION: Bottom Ash Pond
CLIENT: Consumers Energy Company

RECORD OF BOREHOLE BCC-G17-BH-07

SHEET 1 of 1

DRILLING METHOD: GeoProbe
DRILLING DATE: 05-18-17
DRILL RIG: Geo 6620DT

DATUM: NAVD88
AZIMUTH: ---
NAD83 MI PLANE-S COORDS: N 645619.6, E 12623449.8

GS ELEVATION (ft): 595.1
TOC ELEVATION: ---

DEPTH (ft)	BORING METHOD	SOIL PROFILE: DESCRIPTION / VEGETATION:	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	RUN: NUMBER	RUN: REC / ATT	SAMPLES: NUMBER	SAMPLES: TYPE	POCKET PENETROMETER (tons/ft²)	LAB TESTS: ENVIRONMENTAL (SPLP & TOTAL METALS)	LAB TESTS: GRAIN SIZE DISTRIBUTION	NOTES WATER LEVELS
0	Air Vacuum	0.0 - 7.5 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash, fine to coarse, dark gray to red brown, some oxidation, dry.				1	5.00	1	GRAB				
5								2	GRAB				
					587.6	2	4.50 5.00	3	GP				
		7.5 - 9.5 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine to medium, dark gray to red brown, oxidized, dry.			7.5 585.6			4	GP				9.5 ft ▼
10		9.5 - 13.3 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash, coarse, black to red brown, trace oxidation, wet.			9.5			5	GP				
					581.8	3	3.50 5.00	6	GP				
		13.3 - 20.0 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine, dark gray, wet.			13.3								
15								7	GP				
						4	5.00 5.00	8	GP				
					575.1								
20	Geoprobe	20.0 - 22.0 (OL) ORGANIC SILT, low plasticity, black to dark brown, trace organics, cohesive, wet, soft.	OL		20.0 573.1			9	GP				
		22.0 - 29.2 (SP) SAND, poorly graded, medium to fine, gray, trace organics, wet.			22.0	5	5.00 5.00	10	GP				
25			SP					11	GP				20'-35' contains decomposing odor
						6	4.50 5.00						
					565.9			12	GP				
		29.2 - 30.0 (OL) ORGANIC SILT, low plasticity, brown, some wood chips, cohesive, wet, soft.	OL		565.1			13	GP				
30		30.0 - 40.0 (SP) SAND, poorly graded, medium to fine, gray, wet.			30.0	7	2.50 5.00						
35			SP					14	GP				
						8	3.00 5.00						
					555.1								
40		Boring completed at 40.0 ft.						15	GP				
45		NOTES: 1. Air vacuumed to 5 feet bgs to confirm no utilities.											

DEPTH SCALE:1 in to 5.6 ft
DRILLING CONTRACTOR: Mateco
DRILLER: Joe/John

LOGGED: JTT
CHECKED: MMJ
DATE: 6/9/2017

Golder Associates

DUL_BOREHOLE (BC ASH POND) 1667572.0004 BC COBB BAP INVESTIGATION.GPJ DUL.GOLDER.GDT 6/12/17

PROJECT: BC Cobb BAP Investigation

RECORD OF BOREHOLE BCC-G17-BH-08

SHEET 1 of 1

PROJECT NUMBER: 1667572.0004
LOCATION: Bottom Ash Pond
CLIENT: Consumers Energy Company

DRILLING METHOD: GeoProbe
DRILLING DATE: 05-16-17
DRILL RIG: Geo 6620DT

DATUM: NAVD88
AZIMUTH: ---
NAD83 MI PLANE-S COORDS: N 645685.8, E 12623414

GS ELEVATION (ft): 594.9
TOC ELEVATION: ---

DEPTH (ft)	BORING METHOD	SOIL PROFILE: DESCRIPTION / VEGETATION:	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	RUN: NUMBER	RUN: REC / ATT	SAMPLES: NUMBER	SAMPLES: TYPE	POCKET PENETROMETER (tons/ft²)	LAB TESTS: ENVIRONMENTAL (SPLP & TOTAL METALS)	LAB TESTS: GRAIN SIZE DISTRIBUTION	NOTES WATER LEVELS
0	Air Vacuum	0.0 - 13.3 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash, black to gray, some slag, dry, compact.				1	5.00	1	GRAB				
5								2	GRAB				5'-8' yellow, red-brown, oxidized CCR
						2	4.00 5.00	3	GP				
10								4	GP				
						3	4.50 5.00	5	GP				10'-13.3' gray to red-brown oxidized CCR
	Geoprobe	13.3 - 14.6 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, black, dry to moist, soft.			581.6 13.3 580.3			6	GP				
15		14.6 - 17.5 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash, coarse, black, dry, compact.			14.6 577.5			7	GP				
		17.5 - 17.8 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, black, moist to wet, soft.			576.7 18.3	4	3.00 5.00	8 9 10	GP GP GP				17.75 ft ▼
20		17.8 - 18.3 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash, coarse, gray, wet.						11	GP				
		18.3 - 21.6 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, black, wet, soft.	OL		573.3 572.6			12 13	GP GP				
25		21.6 - 22.3 (OL) ORGANIC SILT, low plasticity, black, slight decomposing odor, some wood chips, cohesive, wet.	SP		22.3	5	4.00 5.00						
		22.3 - 25.0 (SP) SAND, poorly graded, medium to fine, gray, slight decomposing odor, wet.			569.9			14	GP				
		Boring completed at 25.0 ft.											

NOTES:
1. Air vacuumed to 5 feet bgs to confirm no utilities.

DEPTH SCALE:1 in to 5.6 ft
DRILLING CONTRACTOR: Mateco
DRILLER: Steve/Joe

LOGGED: JTT
CHECKED: MMJ
DATE: 6/9/2017

Golder Associates

DUL_BOREHOLE (BC ASH POND) 1667572.0004 BC COBB BAP INVESTIGATION.GPJ DUL.GOLDER.GDT 6/12/17

PROJECT: BC Cobb BAP Investigation
PROJECT NUMBER: 1667572.0004
LOCATION: Bottom Ash Pond
CLIENT: Consumers Energy Company

RECORD OF BOREHOLE BCC-G17-BH-09

SHEET 1 of 1

DRILLING METHOD: GeoProbe
DRILLING DATE: 05-16-17
DRILL RIG: Geo 6620DT

DATUM: NAVD88
AZIMUTH: ---
NAD83 MI PLANE-S COORDS: N 645643.5, E 12623509.5

GS ELEVATION (ft): 598.2
TOC ELEVATION: ---

DEPTH (ft)	BORING METHOD	SOIL PROFILE: DESCRIPTION	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	RUN: NUMBER	RUN: REC / ATT	SAMPLES: NUMBER	SAMPLES: TYPE	POCKET PENETROMETER (tons/ft²)	LAB TESTS: ENVIRONMENTAL (SPLP & TOTAL METALS)	LAB TESTS: GRAIN SIZE DISTRIBUTION	NOTES WATER LEVELS
0	Air Vacuum	VEGETATION:											
		0.0 - 17.8 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash, coarse, black, yellow/red-brown oxidation throughout, dry.				1	5.00	1	GRAB				
5								2	GRAB				
						2	4.00 5.00	3	GP				
10						3	4.00 5.00	4	GP				
								5	GP				
15								6	GP				
	Geoprobe				580.4	4	4.00 5.00	7	GP				
		17.8 - 18.6 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, black.			579.6 579.0			8 9	GP GP				
20		18.6 - 19.2 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash, coarse, black.			578.2 20.0			10	GP				
		19.2 - 20.0 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, black.			576.4 21.8			11	GP				
		20.0 - 21.8 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash, coarse, black.	OL		575.0 574.2	5 6	3.50 5.00 3.50 -5.00	12 13	GP GP				
25		21.8 - 23.2 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, black.			24.0								
		23.2 - 24.0 (OL) ORGANIC SILT, low plasticity, dark brown, with wood debris, cohesive.	SP										
		24.0 - 30.0 (SP) SAND, poorly graded, medium to fine grain, gray, some decomposing odor.						14	GP				
30					568.2			15	GP				
		Boring completed at 30.0 ft.											
35													
40													
45													

NOTES:
1. Air vacuumed to 5 feet bgs to confirm no utilities.
2. No water level observed during sampling.

DEPTH SCALE:1 in to 5.6 ft
DRILLING CONTRACTOR: Mateco
DRILLER: Steve/Joe

LOGGED: JTT
CHECKED: MMJ
DATE: 6/9/2017

Golder Associates

DUL_BOREHOLE (BC ASH POND) 1667572.0004 BC COBB BAP INVESTIGATION.GPJ DUL.GOLDER.GDT 6/12/17

PROJECT: BC Cobb BAP Investigation
PROJECT NUMBER: 1667572.0004
LOCATION: Bottom Ash Pond
CLIENT: Consumers Energy Company

RECORD OF BOREHOLE BCC-G17-BH-10

SHEET 1 of 1

DRILLING METHOD: GeoProbe
DRILLING DATE: 05-17-17
DRILL RIG: Geo 6620DT

DATUM: NAVD88
AZIMUTH: ---
NAD83 MI PLANE-S COORDS: N 645742.8, E 12623479.2

GS ELEVATION (ft): 590.5
TOC ELEVATION: ---

DEPTH (ft)	BORING METHOD	SOIL PROFILE: DESCRIPTION / VEGETATION:	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	RUN: NUMBER	RUN: REC / ATT	SAMPLES: NUMBER	SAMPLES: TYPE	POCKET PENETROMETER (tons/ft²)	LAB TESTS: ENVIRONMENTAL (SPLP & TOTAL METALS)	LAB TESTS: GRAIN SIZE DISTRIBUTION	NOTES WATER LEVELS
0	Air Vacuum	0.0 - 8.6 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash, black, dry, compact.				1	5.00	1	GRAB				
5						2	5.00 5.00	2	GRAB				
					581.9			3	GP				
		8.6 - 9.2 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, black, moist.			581.3 9.2			4	GP				
10	Geoprobe	9.2 - 12.0 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash, coarse, black, some CCR slag, moist.			578.5			5	GP				
		12.0 - 14.0 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, black, moist to wet.			12.0 576.5	3	4.00 5.00	6	GP				
		14.0 - 15.0 (OL) ORGANIC SILT, low plasticity, gray to brown, some sand, cohesive, wet.	OL		14.0 575.5			7	GP				
15		15.0 - 20.0 (SP) SAND, poorly graded, medium to fine, gray, wet.	SP		15.0	4	3.50 5.00	8	GP				
								9	GP				
20					570.5			10	GP				
		Boring completed at 20.0 ft.											

NOTES:
1. Air vacuumed to 5 feet bgs to confirm no utilities.
2. No water level observed during sampling.

DEPTH SCALE:1 in to 5.6 ft
DRILLING CONTRACTOR: Mateco
DRILLER: Steve/John

LOGGED: JTT
CHECKED: MMJ
DATE: 6/9/2017

Golder Associates

DUL_BOREHOLE (BC ASH POND) 1667572.0004 BC COBB BAP INVESTIGATION.GPJ DUL.GOLDER.GDT 6/12/17

PROJECT: BC Cobb BAP Investigation

RECORD OF BOREHOLE BCC-G17-BH-11

SHEET 1 of 1

PROJECT NUMBER: 1667572.0004
DRILLING METHOD: GeoProbe
DATUM: NAVD88
GS ELEVATION (ft): 594.9

LOCATION: Bottom Ash Pond
DRILLING DATE: 05-18-17
AZIMUTH: ---
TOC ELEVATION: ---

CLIENT: Consumers Energy Company
DRILL RIG: Geo 6620DT
NAD83 MI PLANE-S COORDS: N 645788.7, E 12623456.9

DEPTH (ft)	BORING METHOD	SOIL PROFILE: DESCRIPTION / VEGETATION:	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	RUN: NUMBER	RUN: REC / ATT	SAMPLES: NUMBER	SAMPLES: TYPE	POCKET PENETROMETER (tons/ft²)	LAB TESTS: ENVIRONMENTAL (SPLP & TOTAL METALS)	LAB TESTS: GRAIN SIZE DISTRIBUTION	NOTES WATER LEVELS
0	Air Vacuum	0.0 - 2.5 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine, gray, dry, soft.			592.4	1	5.00	1	GRAB				
		2.5 - 7.5 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash and cemented Fly Ash, coarse, dark gray to black, dry, compact.			2.5			2	GRAB				
5					587.4	2	3.50 5.00	3	GP				
		7.5 - 8.0 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine, some cementation, dark gray to light brown, dry.			586.9 8.0								
		8.0 - 15.0 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash, coarse, redish brown to black, dry.						4	GP				
10						3	3.50 5.00	5	GP				
								6	GP				
					579.9			7	GP				
15		15.0 - 18.5 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine to medium, some cementation, dark gray, dry to moist.			15.0	4	4.00 5.00						
					576.4			8	GP				19' some organics/wood debris
	Geoprobe	18.5 - 35.0 (SP) SAND, poorly graded, fine to coarse, gray to brown, moist to wet.			18.5			9	GP				
20								10	GP				20 ft ▼
						5	3.00 5.00	11	GP				19.5'-20' brown organic silt layer
								12	GP				
25			SP			6	3.50 5.00	13	GP				18.5-35' strong decomposing odor - gradual change to no odor with depth
								14	GP				
30						7	3.50 5.00	15	GP				34' organics and woody debris at
					559.9			16	GP				
35		Boring completed at 35.0 ft.											
		NOTES: 1. Air vacuumed to 5 feet bgs to confirm no utilities.											
40													
45													

DUL_BOREHOLE (BC ASH POND) 1667572.0004 BC COBB BAP INVESTIGATION.GPJ DUL.GOLDER.GDT 6/12/17

Golder Associates

DEPTH SCALE:1 in to 5.6 ft
DRILLING CONTRACTOR: Mateco
DRILLER: Joe/John

LOGGED: JTT
CHECKED: MMJ
DATE: 6/9/2017

PROJECT: BC Cobb BAP Investigation
PROJECT NUMBER: 1667572.0004
LOCATION: Bottom Ash Pond
CLIENT: Consumers Energy Company

RECORD OF BOREHOLE BCC-G17-BH-12

SHEET 1 of 1

DRILLING METHOD: GeoProbe
DRILLING DATE: 05-16-17
DRILL RIG: Geo 6620DT

DATUM: NAVD88
AZIMUTH: ---
NAD83 MI PLANE-S COORDS: N 645870.7, E 12623424.8

GS ELEVATION (ft): 594.4
TOC ELEVATION: ---

DEPTH (ft)	BORING METHOD	SOIL PROFILE: DESCRIPTION / VEGETATION:	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	RUN: NUMBER	RUN: REC / ATT	SAMPLES: NUMBER	SAMPLES: TYPE	POCKET PENETROMETER (tons/ft²)	LAB TESTS: ENVIRONMENTAL (SPLP & TOTAL METALS)	LAB TESTS: GRAIN SIZE DISTRIBUTION	NOTES WATER LEVELS
0	Air Vacuum	0.0 - 12.6 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash, fine to coarse, black to dark gray, some unburnt coal, some slag, dry to moist.				1	5.00	1	GRAB				
5						2	3.50 5.00	2	GRAB				
								3	GP				
10						3	4.30 5.00	4	GP				
								5	GP				
	Geoprobe	12.6 - 17.8 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine, black to gray, moist to wet.			581.8 12.6								14 ft ▼
15								6	GP				
						4	3.50 5.00	7	GP				
		17.8 - 25.0 (SP) SAND, poorly graded, fine to medium, gray, some organics/wood chips, wet.	SP		576.7 17.8								
20								8	GP				
						5	3.80 5.00	9	GP				
25		Boring completed at 25.0 ft.			569.4			10	GP				
		NOTES: 1. Air vacuumed to 5 feet bgs to confirm no utilities.											
30													
35													
40													
45													

DUL_BOREHOLE (BC ASH POND) 1667572.0004 BC COBB BAP INVESTIGATION.GPJ DUL.GOLDER.GDT 6/12/17

Golder Associates

DEPTH SCALE:1 in to 5.6 ft
DRILLING CONTRACTOR: Mateco
DRILLER: Steve/Joe

LOGGED: JTT
CHECKED: MMJ
DATE: 6/9/2017

RECORD OF BOREHOLE BCC-G17-BH-13

SHEET 1 of 1

PROJECT: BC Cobb BAP Investigation
PROJECT NUMBER: 1667572.0004
LOCATION: Bottom Ash Pond
CLIENT: Consumers Energy Company

DRILLING METHOD: GeoProbe
DRILLING DATE: 05-18-17
DRILL RIG: Geo 6620DT

DATUM: NAVD88
AZIMUTH: ---
NAD83 MI PLANE-S COORDS: N 645927.7, E 12623370.6

GS ELEVATION (ft): 597.1
TOC ELEVATION: ---

DEPTH (ft)	BORING METHOD	SOIL PROFILE: DESCRIPTION / VEGETATION:	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	RUN: NUMBER	RUN: REC / ATT	SAMPLES: NUMBER	SAMPLES: TYPE	POCKET PENETROMETER (tons/ft²)	LAB TESTS: ENVIRONMENTAL (SPLP & TOTAL METALS)	LAB TESTS: GRAIN SIZE DISTRIBUTION	NOTES WATER LEVELS
0	Air Vacuum	0.0 - 12.0 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash, medium to coarse, black, dry to wet, compact.				1	5.00	1	GRAB				2.5'-7.5' some yellow precipitate
5								2	GRAB				
						2	3.50 5.00	3	GP				7.5'-9.25' CCR is red/brown, highly oxidize, pH ~ 3.3
								4	GP				
10								5	GP				
								6	GP				11 ft ▼
					585.1								
		12.0 - 19.0 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine, dark to light gray, wet.			12.0	3	4.50 5.00	7	GP				10'-11' red-brown/gold grains
15								8	GP				
						4	3.50 5.00						
					578.1								
	Geoprobe	19.0 - 35.0 (SP) SAND, poorly graded, medium to fine, gray, wet.			19.0			9	GP				19', some woody debis/ organics
20								10	GP				
						5	3.50 5.00						20', 2" of sand and fly ash
								11	GP				
25			SP					12	GP				24' some woody debris/ organics, decomposing odor
						6	3.50 5.00						
								13	GP				
30								14	GP				29'-30', silty sand, organics, soft
						7	4.50 5.00						32' slight decomposing odor
								15	GP				
					562.1								34' woody debris/ organics
35								16	GP				
		Boring completed at 35.0 ft.											
		NOTES: 1. Air vacuumed to 5 feet bgs to confirm no utilities.											
40													
45													

DEPTH SCALE:1 in to 5.6 ft
DRILLING CONTRACTOR: Mateco
DRILLER: Joe/John

LOGGED: JTT
CHECKED: MMJ
DATE: 6/9/2017

Golder Associates

DUL_BOREHOLE (BC ASH POND) 1667572.0004 BC COBB BAP INVESTIGATION.GPJ DUL.GOLDER.GDT 6/12/17

PROJECT: BC Cobb BAP Investigation

RECORD OF BOREHOLE BCC-G17-BH-14

SHEET 1 of 1

PROJECT NUMBER: 1667572.0004
DRILLING METHOD: GeoProbe
DATUM: NAVD88
GS ELEVATION (ft): 594.4

LOCATION: Bottom Ash Pond
DRILLING DATE: 05-18-17
AZIMUTH: ---
TOC ELEVATION: ---

CLIENT: Consumers Energy Company
DRILL RIG: Geo 6620DT
NAD83 MI PLANE-S COORDS: N 645938, E 12623473.2

DEPTH (ft)	BORING METHOD	SOIL PROFILE: DESCRIPTION / VEGETATION:	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	RUN: NUMBER	RUN: REC / ATT	SAMPLES: NUMBER	SAMPLES: TYPE	POCKET PENETROMETER (tons/ft²)	LAB TESTS: ENVIRONMENTAL (SPLP & TOTAL METALS)	LAB TESTS: GRAIN SIZE DISTRIBUTION	NOTES WATER LEVELS
0	Air Vacuum	0.0 - 12.4 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash, fine to medium, black to red-brown, some slag, mm-scale laminations, dry.				1	5.00	1	GRAB				
5						2	3.50 5.00	2 3 4	GRAB GP GP				7.5'-8' layer of fly ash with mm-scale stratified layers
10					582.0	3	3.50 5.00	5 6	GP GP				
15		12.4 - 18.6 (CCR) COAL COMBUSTION RESIDUALS -Fly Ash, fine to medium, dark gray to red-brown, dry.			12.4	4	3.50 5.00	7 8	GP GP				
20	Geoprobe	18.6 - 19.2 (OL) ORGANIC SILT, low plasticity, black/brown, some woody debris, cohesive, moist.	OL		575.8 575.2	5	3.50 5.00	9 10 11	GP GP GP				20 ft ▼
25		19.2 - 35.0 (SP) SAND, poorly graded, medium to fine, gray, moist to wet.	SP		19.2	6	3.30 5.00	12 13	GP GP				24.8'-25', brown silt layer, trace wood
30						7	1.00 5.00	14	GP				decomposing odor throughout sand layer
35					559.4			15	GP				
		Boring completed at 35.0 ft. NOTES: 1. Air vacuumed to 5 feet bgs to confirm no utilities.											
40													
45													

DEPTH SCALE:1 in to 5.6 ft
DRILLING CONTRACTOR: Mateco
DRILLER: Joe/John

LOGGED: JTT
CHECKED: MMJ
DATE: 6/9/2017

Golder Associates

DUL_BOREHOLE (BC ASH POND) 1667572.0004 BC COBB BAP INVESTIGATION.GPJ DUL.GOLDER.GDT 6/12/17

PROJECT: BC Cobb BAP Investigation

RECORD OF BOREHOLE BCC-G17-BH-15

SHEET 1 of 1

PROJECT NUMBER: 1667572.0004
LOCATION: Bottom Ash Pond
CLIENT: Consumers Energy Company

DRILLING METHOD: GeoProbe
DRILLING DATE: 05-16-17
DRILL RIG: Geo 6620DT

DATUM: NAVD88
AZIMUTH: ---
NAD83 MI PLANE-S COORDS: N 645874.7, E 12623513

GS ELEVATION (ft): 596.9
TOC ELEVATION: ---

DEPTH (ft)	BORING METHOD	SOIL PROFILE: DESCRIPTION / VEGETATION:	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	RUN: NUMBER	RUN: REC / ATT	SAMPLES: NUMBER	SAMPLES: TYPE	POCKET PENETROMETER (tons/ft²)	LAB TESTS: ENVIRONMENTAL (SPLP & TOTAL METALS)	LAB TESTS: GRAIN SIZE DISTRIBUTION	NOTES WATER LEVELS
0	Air Vacuum	0.0 - 12.3 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash, coarse, black, dry.				1	5.00	1 2 3	GRAB GRAB GRAB				
5	Geoprobe					2	3.50 5.00	4 5 6	GP GP GP				5'-10', red/brown, some oxidation
10					584.6	3	3.00 5.00	7	GP				8.8'-9.2', Layer of CCR - Bottom Ash
15		12.3 - 18.0 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine, dark gray.			12.3 578.9	4	5.00	8 9	GP GP				
20		18.0 - 25.0 (SP) SAND, poorly graded, medium to fine, gray.	SP		18.0	5	3.50 5.00	10 11 12	GP GP GP				1" layer of organic silt between CCR and sand, decomposing odor 22' Decomposing odors
25		Boring completed at 25.0 ft.			571.9			13	GP				

NOTES:
1. Air vacuumed to 5 feet bgs to confirm no utilities.
2. No water level observed during sampling.

DEPTH SCALE:1 in to 5.6 ft
DRILLING CONTRACTOR: Mateco
DRILLER: Steve/Joe

LOGGED: JTT
CHECKED: MMJ
DATE: 6/9/2017

Golder Associates

DUL_BOREHOLE (BC ASH POND) 1667572.0004 BC COBB BAP INVESTIGATION.GPJ DUL.GOLDER.GDT 6/12/17

PROJECT: BC Cobb BAP Investigation

RECORD OF BOREHOLE BCC-G17-BH-16

SHEET 1 of 1

PROJECT NUMBER: 1667572.0004
DRILLING METHOD: GeoProbe
DATUM: NAVD88
GS ELEVATION (ft): 590.1

LOCATION: Bottom Ash Pond
DRILLING DATE: 05-17-17
AZIMUTH: ---
TOC ELEVATION: ---

CLIENT: Consumers Energy Company
DRILL RIG: Geo 6620DT
NAD83 MI PLANE-S COORDS: N 645799.7, E 12623535.8

DEPTH (ft)	BORING METHOD	SOIL PROFILE: DESCRIPTION / VEGETATION:	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	RUN: NUMBER	RUN: REC / ATT	SAMPLES: NUMBER	SAMPLES: TYPE	POCKET PENETROMETER (tons/ft²)	LAB TESTS: ENVIRONMENTAL (SPLP & TOTAL METALS)	LAB TESTS: GRAIN SIZE DISTRIBUTION	NOTES WATER LEVELS
0	Air Vacuum	0.0 - 2.5 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine, black, dry.			587.6								
		2.5 - 9.0 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash, coarse, black, dry, compact.			2.5	1	5.00	1	GRAB				
5								2	GRAB				
						2	5.00 5.00	3	GP				
					581.1			4	GP				
	Geoprobe	9.0 - 14.2 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine, black, moist, soft.			9.0			5	GP				10'-10.5' layer of CCR - Bottom Ash, black, moist
10								6	GP				
						3	3.50 5.00						
					575.9			7	GP				
		14.2 - 15.0 (OL) ORGANIC SILT, low plasticity, black, some woody debris, cohesive, moist, soft.	OL		575.1			8	GP				
15		15.0 - 20.0 (SP) SAND, poorly graded, fine to medium, gray, moist.	SP		15.0	4	3.00 5.00	9	GP				16.5' & 18.5' woody debris
								10	GP				
20					570.1								
		Boring completed at 20.0 ft.											

NOTES:
1. Air vacuumed to 5 feet bgs to confirm no utilities.
2. No water level observed during sampling.

DEPTH SCALE:1 in to 5.6 ft
DRILLING CONTRACTOR: Mateco
DRILLER: Steve/John

LOGGED: JTT
CHECKED: MMJ
DATE: 6/9/2017

Golder Associates

DUL_BOREHOLE (BC ASH POND) 1667572.0004 BC COBB BAP INVESTIGATION.GPJ DUL.GOLDER.GDT 6/12/17

PROJECT: BC Cobb BAP Investigation
PROJECT NUMBER: 1667572.0004
LOCATION: Bottom Ash Pond
CLIENT: Consumers Energy Company

RECORD OF BOREHOLE BCC-G17-BH-17

SHEET 1 of 1

DRILLING METHOD: GeoProbe
DRILLING DATE: 05-16-17
DRILL RIG: Geo 6620DT

DATUM: NAVD88
AZIMUTH: ---
NAD83 MI PLANE-S COORDS: N 645750.6, E 12623557

GS ELEVATION (ft): 588.6
TOC ELEVATION: ---

DEPTH (ft)	BORING METHOD	SOIL PROFILE: DESCRIPTION / VEGETATION:	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	RUN: NUMBER	RUN: REC / ATT	SAMPLES: NUMBER	SAMPLES: TYPE	POCKET PENETROMETER (tons/ft²)	LAB TESTS: ENVIRONMENTAL (SPLP & TOTAL METALS)	LAB TESTS: GRAIN SIZE DISTRIBUTION	NOTES WATER LEVELS
0	Air Vacuum	0.0 - 7.9 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash, coarse, black, dry.				1	5.00	1	GRAB				
5								2	GRAB				
					580.7	2	4.50 5.00	3	GP				
		7.9 - 8.2 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine, black, moist.			579.9 8.7			4 5	GP GP				
10	Geoprobe	8.2 - 8.7 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash, coarse, black, moist. 8.7 - 13.6 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine, black, moist, soft.			575.0	3	3.00 5.00	6	GP				
		13.6 - 14.3 (OL) ORGANIC SILT, low plasticity, black to brown, some wood debris, cohesive, moist.	OL		574.3 14.3			7 8	GP GP				
15		14.3 - 20.0 (SP) SAND, poorly graded, fine to medium, gray, trace organics, moist.	SP			4	3.00 5.00	9 10	GP GP				
20		Boring completed at 20.0 ft.			568.6			11	GP				

NOTES:
1. Air vacuumed to 5 feet bgs to confirm no utilities.
2. No water level observed during sampling.

DEPTH SCALE:1 in to 5.6 ft
DRILLING CONTRACTOR: Mateco
DRILLER: Steve/Joe

LOGGED: JTT
CHECKED: MMJ
DATE: 6/9/2017

Golder Associates

DUL_BOREHOLE (BC ASH POND) 1667572.0004 BC COBB BAP INVESTIGATION.GPJ DUL.GOLDER.GDT 6/12/17

PROJECT: BC Cobb BAP Investigation
PROJECT NUMBER: 1667572.0004
LOCATION: Bottom Ash Pond
CLIENT: Consumers Energy Company

RECORD OF BOREHOLE BCC-G17-BH-18

SHEET 1 of 1

DRILLING METHOD: GeoProbe
DRILLING DATE: 05-17-17
DRILL RIG: Geo 6620DT

DATUM: NAVD88
AZIMUTH: ---
NAD83 MI PLANE-S COORDS: N 645653, E 12623697

GS ELEVATION (ft): 596.5
TOC ELEVATION: ---

DEPTH (ft)	BORING METHOD	SOIL PROFILE: DESCRIPTION / VEGETATION:	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	RUN: NUMBER	RUN: REC / ATT	SAMPLES: NUMBER	SAMPLES: TYPE	POCKET PENETROMETER (tons/ft²)	LAB TESTS: ENVIRONMENTAL (SPLP & TOTAL METALS)	LAB TESTS: GRAIN SIZE DISTRIBUTION	NOTES WATER LEVELS
0	Air Vacuum	0.0 - 6.7 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash, coarse, black to red-brown, some unburnt coal/slag, dry, compact.				1	5.00	1	GRAB				
5								2	GRAB				
					589.8			3	GP				
		6.7 - 9.8 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine, black, trace unburnt coal, moist.			6.7	2	4.00 5.00	4 5	GP GP				
					586.7			6	GP				8.45'-8.9' layer of CCR - Bottom Ash, coarse, black, moist
10	Geoprobe	9.8 - 10.0 (OL) ORGANIC SILT, low plasticity, black, cohesive, moist, soft.	OL		10.0			7	GP				
		10.0 - 20.0 (SP) SAND, poorly graded, fine to medium, gray, some woody debris and organics, moist.				3	2.00 5.00	8	GP				
15			SP					9	GP				
						4	4.00 5.00	10	GP				17', 1" seam or organic silt/sand, brown, some woody debris
					576.5								
20		Boring completed at 20.0 ft.						11	GP				19', 2" seam of organic silt, brown
25													
30													
35													
40													
45													

NOTES:
1. Air vacuumed to 5 feet bgs to confirm no utilities.
2. No water level observed during sampling.

DEPTH SCALE:1 in to 5.6 ft
DRILLING CONTRACTOR: Mateco
DRILLER: Steve/John

LOGGED: JTT
CHECKED: MMJ
DATE: 6/9/2017

Golder Associates

DUL_BOREHOLE (BC ASH POND) 1667572.0004 BC COBB BAP INVESTIGATION.GPJ DUL.GOLDER.GDT 6/12/17

PROJECT: BC Cobb BAP Investigation
PROJECT NUMBER: 1667572.0004
LOCATION: Bottom Ash Pond
CLIENT: Consumers Energy Company

RECORD OF BOREHOLE BCC-G17-BH-19

SHEET 1 of 1

DRILLING METHOD: GeoProbe
DRILLING DATE: 05-17-17
DRILL RIG: Geo 6620DT

DATUM: NAVD88
AZIMUTH: ---
NAD83 MI PLANE-S COORDS: N 645812, E 12623616.5

GS ELEVATION (ft): 595.2
TOC ELEVATION: ---

DEPTH (ft)	BORING METHOD	SOIL PROFILE: DESCRIPTION / VEGETATION:	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	RUN: NUMBER	RUN: REC / ATT	SAMPLES: NUMBER	SAMPLES: TYPE	POCKET PENETROMETER (tons/ft²)	LAB TESTS: ENVIRONMENTAL (SPLP & TOTAL METALS)	LAB TESTS: GRAIN SIZE DISTRIBUTION	NOTES WATER LEVELS
0	Air Vacuum	0.0 - 11.0 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash, coarse, black, some oxidation, partially cemented, dry to moist.				1	5.00	1A 1B	GRAB GRAB				
5						2	3.90 5.00	1 2	GP GP				
10					584.2			3 4	GP GP				10 ft ▼
	Geoprobe	11.0 - 18.7 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine, black to gray, wet.			11.0	3	5.00 5.00	5	GP				
15						4	1.50 5.00	6	GP				
					576.5								
		18.7 - 25.0 (SP) SAND, poorly graded, fine to medium, gray, wet, loose.	SP		18.7			7 8	GP GP				20', 2" seam of organic silt
20						5	5.00	9	GP				
25					570.2			10	GP				24.5', 3" seam of organic silt
		Boring completed at 25.0 ft.											
30													
35													
40													
45													

NOTES:
1. Air vacuumed to 5 feet bgs to confirm no utilities.

DEPTH SCALE:1 in to 5.6 ft
DRILLING CONTRACTOR: Mateco
DRILLER: Steve/John

LOGGED: JTT
CHECKED: MMJ
DATE: 6/9/2017

Golder Associates

DUL_BOREHOLE (BC ASH POND) 1667572.0004 BC COBB BAP INVESTIGATION.GPJ DUL.GOLDER.GDT 6/12/17

PROJECT: BC Cobb BAP Investigation
PROJECT NUMBER: 1667572.0004
LOCATION: Bottom Ash Pond
CLIENT: Consumers Energy Company

RECORD OF BOREHOLE BCC-G17-BH-20

SHEET 1 of 1

DRILLING METHOD: GeoProbe
DRILLING DATE: 05-16-17
DRILL RIG: Geo 6620DT

DATUM: NAVD88
AZIMUTH: ---
NAD83 MI PLANE-S COORDS: N 645854, E 12623594

GS ELEVATION (ft): 593.6
TOC ELEVATION: ---

DEPTH (ft)	BORING METHOD	SOIL PROFILE: DESCRIPTION / VEGETATION:	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	RUN: NUMBER	RUN: REC / ATT	SAMPLES: NUMBER	SAMPLES: TYPE	POCKET PENETROMETER (tons/ft²)	LAB TESTS: ENVIRONMENTAL (SPLP & TOTAL METALS)	LAB TESTS: GRAIN SIZE DISTRIBUTION	NOTES WATER LEVELS
0	Air Vacuum	0.0 - 8.0 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash, black to red-brown, some oxidation, dry.				1	5.00	1 2 3 4	GRAB GRAB GP GP				
5	Geoprobe				585.6	2	3.50 5.00	5 6 7 8	GP GP GP GP				
		8.0 - 9.0 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, dark gray, dry.			8.0 584.6								
10		9.0 - 10.5 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash, black, dry.			9.0 583.1								
		10.5 - 18.5 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, black to gray, moist.			10.5	3	3.50 5.00	9	GP				
15						4	3.00 5.00	10 11 12 13	GP GP GP GP				16', 2" seam of Bottom ash/ slag
		18.5 - 25.0 (SP) SAND, poorly graded, fine to medium, gray, moist to wet.	SP		575.1 18.5								19.5'-20' organic silt layer, some sand
20						5	4.00 5.00	14	GP				21' Decomposing odor
25					568.6			15	GP				
		Boring completed at 25.0 ft.											
30													
35													
40													
45													

NOTES:
1. Air vacuumed to 5 feet bgs to confirm no utilities.
2. No water level observed during sampling.

DEPTH SCALE:1 in to 5.6 ft
DRILLING CONTRACTOR: Mateco
DRILLER: Steve/Joe

LOGGED: JTT
CHECKED: MMJ
DATE: 6/9/2017

Golder Associates

DUL_BOREHOLE (BC ASH POND) 1667572.0004 BC COBB BAP INVESTIGATION.GPJ DUL.GOLDER.GDT 6/12/17

PROJECT: BC Cobb BAP Investigation
PROJECT NUMBER: 1667572.0004
LOCATION: Bottom Ash Pond
CLIENT: Consumers Energy Company

RECORD OF BOREHOLE BCC-G17-BH-21

SHEET 1 of 1

DRILLING METHOD: GeoProbe
DRILLING DATE: 05-15-17
DRILL RIG: Geo 6620DT

DATUM: NAVD88
AZIMUTH: ---
NAD83 MI PLANE-S COORDS: N 645765, E 12623717

GS ELEVATION (ft): 592.3
TOC ELEVATION: ---

DEPTH (ft)	BORING METHOD	SOIL PROFILE: DESCRIPTION / VEGETATION:	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	RUN: NUMBER	RUN: REC / ATT	SAMPLES: NUMBER	SAMPLES: TYPE	POCKET PENETROMETER (tons/ft²)	LAB TESTS: ENVIRONMENTAL (SPLP & TOTAL METALS)	LAB TESTS: GRAIN SIZE DISTRIBUTION	NOTES WATER LEVELS
0	Air Vacuum	0.0 - 7.3 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash, coarse, dark brown to yellow-brown, some pebbles, partially cemented, moist.				1	5.00	1	GRAB				
5								2	GRAB				
					585.0								
	Geoprobe	7.3 - 17.8 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine to medium, black to red-brown, trace slag, some oxidation, moist to wet.			7.3	2	4.00 5.00	3	GP				
								4	GP				
10								5	GP				10 ft ▼
						3	5.00 5.00	6	GP				
15								7	GP				
					574.5	4	3.50 5.00	8	GP				
		17.8 - 19.0 (OL) ORGANIC SILT, low plasticity, dark brown, some sand, cohesive, wet.	OL		17.8 573.3			9	GP				18.8', 2" layer with wood debris
		19.0 - 25.0 (SP) SAND, poorly graded, medium to coarse, grayish brown, wet, compact.			19.0			10	GP				
20			SP			5	5.00 5.00	11	GP				
					567.3								
25		Boring completed at 25.0 ft.						12	GP				

NOTES:
1. Air vacuumed to 5 feet bgs to confirm no utilities.

DEPTH SCALE:1 in to 5.6 ft
DRILLING CONTRACTOR: Mateco
DRILLER: Steve/Joe

LOGGED: DAF
CHECKED: MMJ
DATE: 6/9/2017

Golder Associates

DUL_BOREHOLE (BC ASH POND) 1667572.0004 BC COBB BAP INVESTIGATION.GPJ DUL.GOLDER.GDT 6/12/17

PROJECT: BC Cobb BAP Investigation
PROJECT NUMBER: 1667572.0004
LOCATION: Bottom Ash Pond
CLIENT: Consumers Energy Company

RECORD OF BOREHOLE BCC-G17-BH-22

SHEET 1 of 1

DRILLING METHOD: GeoProbe
DRILLING DATE: 05-15-17
DRILL RIG: Geo 6620DT

DATUM: NAVD88
AZIMUTH: ---
NAD83 MI PLANE-S COORDS: N 645714.7, E 12623745.8

GS ELEVATION (ft): 591.9
TOC ELEVATION: ---

DEPTH (ft)	BORING METHOD	SOIL PROFILE: DESCRIPTION / VEGETATION:	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	RUN: NUMBER	RUN: REC / ATT	SAMPLES: NUMBER	SAMPLES: TYPE	POCKET PENETROMETER (tons/ft²)	LAB TESTS: ENVIRONMENTAL (SPLP & TOTAL METALS)	LAB TESTS: GRAIN SIZE DISTRIBUTION	NOTES WATER LEVELS
0	Air Vacuum	0.0 - 9.2 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine, black, trace unburnt coal, moist to wet.				1	5.00	1A	GRAB				
5								1B	GRAB				5 ft ▼
						2	5.00 5.00	1	GP				
					582.7			2	GP				
10	Geoprobe	9.2 - 10.5 (OL) ORGANIC SILT, low plasticity, brown, some sand, some wood debris, cohesive, wet.	OL		9.2 581.4			3	GP				Sand content increases with depth
		10.5 - 20.0 (SP) SAND, poorly graded, medium to coarse, gray, wet, compact.			10.5			4	GP				
						3	5.00 5.00	5	GP				
15			SP					15	GP				Decomposing odor
						4	4.00 5.00	7	GP				18', 1" layer of organic silt with sand
20					571.9			10	GP				19.5', 1" layer of organic silt with sand
		Boring completed at 20.0 ft.											
25													
30													
35													
40													
45													

NOTES:
1. Air vacuumed to 5 feet bgs to confirm no utilities.

DEPTH SCALE:1 in to 5.6 ft
DRILLING CONTRACTOR: Mateco
DRILLER: Steve/Joe

LOGGED: DAF
CHECKED: MMJ
DATE: 6/9/2017

Golder Associates

DUL_BOREHOLE (BC ASH POND) 1667572.0004 BC COBB BAP INVESTIGATION.GPJ DUL.GOLDER.GDT 6/12/17

PROJECT: BC Cobb BAP Investigation
PROJECT NUMBER: 1667572.0004
LOCATION: Bottom Ash Pond
CLIENT: Consumers Energy Company

RECORD OF BOREHOLE BCC-G17-BH-23

SHEET 1 of 1

DRILLING METHOD: GeoProbe
DRILLING DATE: 05-15-17
DRILL RIG: Geo 6620DT

DATUM: NAVD88
AZIMUTH: ---
NAD83 MI PLANE-S COORDS: N 645724.7, E 12623794.5

GS ELEVATION (ft): 590.1
TOC ELEVATION: ---

DEPTH (ft)	BORING METHOD	SOIL PROFILE: DESCRIPTION / VEGETATION:	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	RUN: NUMBER	RUN: REC / ATT	SAMPLES: NUMBER	SAMPLES: TYPE	POCKET PENETROMETER (tons/ft²)	LAB TESTS: ENVIRONMENTAL (SPLP & TOTAL METALS)	LAB TESTS: GRAIN SIZE DISTRIBUTION	NOTES WATER LEVELS
0	Air Vacuum	0.0 - 5.0 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash, medium to coarse, black, some unburnt coal, dry.			585.1	1	5.00	1A	GRAB				
5	Geoprobe	5.0 - 9.7 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine, gray, wet.			5.0 580.4	2	3.50 5.00	1B 1	GRAB GP				5 ft ▼
10		9.7 - 11.5 (OL) ORGANIC SILT, low plasticity, brown, some sand, some wood debris, cohesive, wet.	OL		9.7 578.6			2 3	GP GP				9.8' Decomposing odor
15		11.5 - 20.0 (SP) SAND, medium to coarse, grayish brown, wet, compact.	SP		11.5 570.1	3 4	5.00 5.00 2.50 5.00	4 5 6	GP GP GP				12.3', 2" layer of silty sand with organics 13.7', 3" layer of silty sand with organics 18', 6" layer of silty sand
20		Boring completed at 20.0 ft.						7	GP				

NOTES:
1. Air vacuumed to 5 feet bgs to confirm no utilities.

DEPTH SCALE:1 in to 5.6 ft
DRILLING CONTRACTOR: Mateco
DRILLER: Steve/Joe

LOGGED: DAF
CHECKED: MMJ
DATE: 6/9/2017

Golder Associates

DUL_BOREHOLE (BC ASH POND) 1667572.0004 BC COBB BAP INVESTIGATION.GPJ DUL.GOLDER.GDT 6/12/17

PROJECT: BC Cobb BAP Investigation
PROJECT NUMBER: 1667572.0004
LOCATION: Bottom Ash Pond
CLIENT: Consumers Energy Company

RECORD OF BOREHOLE BCC-G17-BH-24

SHEET 1 of 1

DRILLING METHOD: GeoProbe
DRILLING DATE: 05-18-17
DRILL RIG: Geo 6620DT

DATUM: NAVD88
AZIMUTH: ---
NAD83 MI PLANE-S COORDS: N 645748.9, E 12623872.7

GS ELEVATION (ft): 585.6
TOC ELEVATION: ---

DEPTH (ft)	BORING METHOD	SOIL PROFILE: DESCRIPTION / VEGETATION:	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	RUN: NUMBER	RUN: REC / ATT	SAMPLES: NUMBER	SAMPLES: TYPE	POCKET PENETROMETER (tons/ft²)	LAB TESTS: ENVIRONMENTAL (SPLP & TOTAL METALS)	LAB TESTS: GRAIN SIZE DISTRIBUTION	NOTES WATER LEVELS
0	Air Vacuum	0.0 - 2.5 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash, medium, black to dark gray, dry.			583.1								
		2.5 - 8.5 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine to medium, black to dark gray, moist, loose.			2.5	1	5.00	1	GRAB				
5								2	GRAB				
						2	2.50 5.00						
					577.1			3	GP				
		8.5 - 9.3 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash, medium to coarse, black, moist.	OL		576.3 575.6			4	GP				
10	Geoprobe	9.3 - 10.0 (OL) ORGANIC SILT, low plasticity, black, trace wood chips, cohesive, moist, soft.			10.0			5	GP				10 ft ▼
		10.0 - 20.0 (SP) SAND, poorly graded, fine to medium, gray, some brown silt, trace organics, wet.				3	3.80 5.00	6	GP				
15			SP					7	GP				
						4	4.50 5.00	8	GP				
					565.6								18.75', black organics/wood
20		Boring completed at 20.0 ft.						9	GP				

NOTES:
1. Air vacuumed to 5 feet bgs to confirm no utilities.

DEPTH SCALE:1 in to 5.6 ft
DRILLING CONTRACTOR: Mateco
DRILLER: Joe/John

LOGGED: JTT
CHECKED: MMJ
DATE: 6/9/2017

Golder Associates

DUL_BOREHOLE (BC ASH POND) 1667572.0004 BC COBB BAP INVESTIGATION.GPJ DUL.GOLDER.GDT 6/12/17

PROJECT: BC Cobb BAP Investigation
PROJECT NUMBER: 1667572.0004
LOCATION: Bottom Ash Pond
CLIENT: Consumers Energy Company

RECORD OF BOREHOLE BCC-G17-BH-25

SHEET 1 of 1

DRILLING METHOD: GeoProbe
DRILLING DATE: 05-15-17
DRILL RIG: Geo 6620DT

DATUM: NAVD88
AZIMUTH: ---
NAD83 MI PLANE-S COORDS: N 645783.2, E 12623873.3

GS ELEVATION (ft): 586.9
TOC ELEVATION: ---

DEPTH (ft)	BORING METHOD	SOIL PROFILE: DESCRIPTION	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	RUN: NUMBER	RUN: REC / ATT	SAMPLES: NUMBER	SAMPLES: TYPE	POCKET PENETROMETER (tons/ft²)	LAB TESTS: ENVIRONMENTAL (SPLP & TOTAL METALS)	LAB TESTS: GRAIN SIZE DISTRIBUTION	NOTES WATER LEVELS
0	Air Vacuum	VEGETATION: 0.0 - 2.5 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash, coarse, black, some unburnt coal, dry.			584.4								
		2.5 - 11.0 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine, dark gray, moist to wet.			2.5	1	5.00	1A	GRAB				
5								1B	GRAB				5 ft ▼
						2	0.50 5.00						
10	Geoprobe				575.9			1	GP				
		11.0 - 20.0 (SP) SAND, poorly graded, medium to coarse, grayish brown, some organics, decomposing odor, wet, compact.	SP		11.0	3	4.00 5.00						
15								2	GP				
						4	3.80 5.00						
20		Boring completed at 20.0 ft.			566.9			3	GP				18.5', silty sand with organics
		NOTES: 1. Air vacuumed to 5 feet bgs to confirm no utilities.											
25													
30													
35													
40													
45													

DEPTH SCALE:1 in to 5.6 ft
DRILLING CONTRACTOR: Mateco
DRILLER: Steve/Joe

LOGGED: MMJ
CHECKED: MMJ
DATE: 6/9/2017

Golder Associates

DUL_BOREHOLE (BC ASH POND) 1667572.0004 BC COBB BAP INVESTIGATION.GPJ DUL.GOLDER.GDT 6/12/17

RECORD OF BOREHOLE BCC-G17-BH-26

SHEET 1 of 1

PROJECT: BC Cobb Pond 0-8 Invest.
PROJECT NUMBER: 1667572.0004
LOCATION: N end of Ponds 3 and 4 interior berm
CLIENT: Consumers Energy Company

DRILLING METHOD: GeoProbe
DRILLING DATE: 11/29/2017
DRILL RIG: Geo 6620DT

DATUM: NAVD88
AZIMUTH: ---
NAD83 MI PLANE-S COORDS: N 646765.66, E 12622228.2

GS ELEVATION (ft): 586.3
TOC ELEVATION: ---

DEPTH (ft)	BORING METHOD	SOIL PROFILE: DESCRIPTION / VEGETATION:	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	RUN: NUMBER	RUN: REC / ATT	SAMPLES: NUMBER	SAMPLES: TYPE	POCKET PENETROMETER (tons/ft²)	LAB TESTS: ENVIRONMENTAL (SPLP & TOTAL METALS)	LAB TESTS: GRAIN SIZE DISTRIBUTION	NOTES WATER LEVELS
0	Geoprobe	0.0 - 2.8 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash, coarse grain, black to brown, non-cohesive, moist.			583.5	1	3.80 5.00	1	GP				
		2.8 - 3.3 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine grain, gray, non-cohesive, moist.			2.8 583.0			2	GP				
		3.3 - 5.0 (SP) SAND, poorly graded, fine to medium grain, with CCR (fly ash), orange to tan, non-cohesive, wet.	SP		3.3 581.3			3	GP				
5		5.0 - 5.5 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash, fine to coarse grain, black, non-cohesive, wet.			5.0 580.8	2	3.40 5.00	4	GP				
		5.5 - 7.7 (SP) SAND, poorly graded, medium to fine grain, with CCR (fly ash), orange to tan, non-cohesive, wet.	SP		5.5 578.6			5	GP				
		7.7 - 8.5 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine to medium grain, gray, non-cohesive, wet.			7.7 577.8			6	GP				
		8.5 - 9.0 (SP) SAND, poorly graded, medium to fine grain, with CCR (fly ash), tan, non-cohesive, wet.	SP		8.5 577.3			7	GP				8.6 ft ▼ 11/29/2017 15:27
		9.0 - 10.0 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine to medium grain, gray, non-cohesive, wet.			9.0 576.3								
10		10.0 - 10.8 (SP) SAND, poorly graded, fine to medium grain, orange to tan, non-cohesive, wet.	SP		10.0 575.5	3	5.00 5.00	8	GP				Organics and wood debris
		10.8 - 11.8 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine to medium grain, gray, non-cohesive, wet.			10.8 574.5								
		11.8 - 18.5 (SP) SAND, poorly graded, fine to medium grain, tan, non-cohesive, wet.	SP		11.8 567.8			9	GP				Organics and wood debris
15						4	5.00 5.00	10	GP				
		18.5 - 20.0 ORGANICS, wood debris, brown, non-cohesive, wet.			18.5 566.3								
20		Boring completed at 20.0 ft.											
25													

DEPTH SCALE:1 in to 3.1 ft
DRILLING CONTRACTOR: Mateco
DRILLER: Steve/John

LOGGED: HD
CHECKED: MMJ
DATE: 12/13/2017

Golder Associates

DUL_BOREHOLE (BC ASH POND) 1667572.0004 BC COBB POND 0-8 INVESTIGATION.GPJ DUL.GOLDER.GDT 12/19/17

RECORD OF BOREHOLE BCC-G17-BH-27

SHEET 1 of 1

PROJECT: BC Cobb Pond 0-8 Invest.
PROJECT NUMBER: 1667572.0004
LOCATION: Middle of Ponds 3 and 4 interior berm
CLIENT: Consumers Energy Company

DRILLING METHOD: GeoProbe
DRILLING DATE: 11/29/2017
DRILL RIG: Geo 6620DT

DATUM: NAVD88
AZIMUTH: ---
NAD83 MI PLANE-S COORDS: N 646562.81, E 12622524

GS ELEVATION (ft): 588.9
TOC ELEVATION: ---

DEPTH (ft)	BORING METHOD	SOIL PROFILE: DESCRIPTION / VEGETATION:	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	RUN: NUMBER	RUN: REC / ATT	SAMPLES: NUMBER	SAMPLES: TYPE	POCKET PENETROMETER (tons/ft²)	LAB TESTS: ENVIRONMENTAL (SPLP & TOTAL METALS)	LAB TESTS: GRAIN SIZE DISTRIBUTION	NOTES WATER LEVELS
0	Geoprobe	0.0 - 2.8 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash, fine to coarse grain, black, non-cohesive, dry.			586.1	1	3.50 5.00	1	GP				
		2.8 - 6.0 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine to medium grain, gray, non-cohesive, moist.			2.8 582.9			2	GP				
5								3	GP				
		6.0 - 6.8 (SP) SAND, poorly graded, fine to medium grain, with CCR (fly ash), tan, non-cohesive, moist.	SP		6.0 582.1			4	GP				
		6.8 - 7.1 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine to medium grain, gray, non-cohesive, moist.			581.8 7.1			5	GP				
		7.1 - 8.8 (SP) SAND, poorly graded, fine to medium grain, with CCR (fly ash), tan, non-cohesive, moist.	SP		580.1	2	4.20 5.00	6	GP				
		8.8 - 10.0 ORGANICS and wood debris, reddish brown, non-cohesive, wet.			8.8 578.9								
10		10.0 - 11.8 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine to medium grain, gray, non-cohesive, wet.			10.0 577.1			7	GP				10.3 ft ▼ 11/29/17 16:40
		11.8 - 12.1 ORGANICS and wood debris, reddish brown, non-cohesive, wet.			576.8 12.1								
		12.1 - 15.0 (SP) SAND, poorly graded, with CCR (fly ash), tan to gray, non-cohesive, wet.	SP		573.9			8	GP				
15		15.0 - 16.0 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine grain, gray, non-cohesive, wet.			15.0 572.9	3	2.80 10.00	9	GP				
		16.0 - 20.9 (SP) SAND, poorly graded, fine to medium grain, tan to gray, non-cohesive, wet.	SP		16.0			10	GP				Organic woody debris at 16.2', 16.4', and 16.5'
20					568.0			11	GP				
		20.9 - 22.2 ORGANICS and wood debris, reddish brown, non-cohesive, wet.			20.9 566.7								
		22.2 - 25.0 (SP) SAND, poorly graded, fine to medium grain, tan to gray, non-cohesive, wet.	SP		22.2	4	3.10 5.00	12	GP				
25		Boring completed at 25.0 ft.			563.9								

DEPTH SCALE:1 in to 3.1 ft
DRILLING CONTRACTOR: Mateco
DRILLER: Steve/John

LOGGED: HD
CHECKED: MMJ
DATE: 12/13/2017

Golder Associates

DUL_BOREHOLE (BC ASH POND) 1667572.0004 BC COBB POND 0-8 INVESTIGATION.GPJ DUL.GOLDER.GDT 12/19/17

RECORD OF BOREHOLE BCC-G17-BH-28

SHEET 1 of 1

PROJECT: BC Cobb Pond 0-8 Invest.
PROJECT NUMBER: 1667572.0004
LOCATION: S end of Ponds 3 and 4 interior berm
CLIENT: Consumers Energy Company

DRILLING METHOD: GeoProbe
DRILLING DATE: 11/30/2017
DRILL RIG: Geo 6620DT

DATUM: NAVD88
AZIMUTH: ---
NAD83 MI PLANE-S COORDS: N 646375.91, E 12622823.7

GS ELEVATION (ft): 588.9
TOC ELEVATION: ---

DEPTH (ft)	BORING METHOD	SOIL PROFILE: DESCRIPTION / VEGETATION:	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	RUN: NUMBER	RUN: REC / ATT	SAMPLES: NUMBER	SAMPLES: TYPE	POCKET PENETROMETER (tons/ft²)	LAB TESTS: ENVIRONMENTAL (SPLP & TOTAL METALS)	LAB TESTS: GRAIN SIZE DISTRIBUTION	NOTES WATER LEVELS
0	Geoprobe	0.0 - 0.4 ORGANICS with wood debris, brown, non-cohesive, moist.			588.5 0.4								
		0.4 - 1.9 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash, fine to coarse grain, black to brown, non-cohesive, moist.			587.0			1	GP				
		1.9 - 10.0 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine to medium grain, gray, black organics throughout, non-cohesive, moist.			1.9	1	3.70 5.00	2	GP				
5						2	3.00 5.00	3	GP				Organics and wood debris Organics and wood debris
10		10.0 - 10.4 ORGANICS with wood debris, reddish brown, non-cohesive, moist.			578.9 578.5 10.4								10.6 ft 11/30/2017 08:59
		10.4 - 15.0 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine to medium grain, gray, non-cohesive, wet.						4	GP				
15		15.0 - 16.0 (SP) SAND, poorly graded, fine to medium grain, with CCR (fly ash), dark gray, non-cohesive, wet.	SP		573.9 15.0 572.9	3	3.80 10.00	5	GP				
		16.0 - 25.0 (SP) SAND, poorly graded, fine to medium grain, gray, non-cohesive, wet.			16.0			6	GP				Organics and wood debris
20			SP			4	3.10 5.00	7	GP				Organics and wood debris
25		Boring completed at 25.0 ft.			563.9								

DEPTH SCALE:1 in to 3.1 ft
DRILLING CONTRACTOR: Mateco
DRILLER: Steve/John

LOGGED: HD
CHECKED: MMJ
DATE: 12/13/2017

Golder Associates

DUL_BOREHOLE (BC ASH POND) 1667572.0004 BC COBB POND 0-8 INVESTIGATION.GPJ DUL.GOLDER.GDT 12/19/17

RECORD OF BOREHOLE BCC-G17-BH-29

SHEET 1 of 1

PROJECT: BC Cobb Pond 0-8 Invest.
PROJECT NUMBER: 1667572.0004
LOCATION: N end of Ponds 2 and 3 interior berm
CLIENT: Consumers Energy Company

DRILLING METHOD: GeoProbe
DRILLING DATE: 11/29/2017
DRILL RIG: Geo 6620DT

DATUM: NAVD88
AZIMUTH: ---
NAD83 MI PLANE-S COORDS: N 646805.16, E 12622449.9

GS ELEVATION (ft): 585.7
TOC ELEVATION: ---

DEPTH (ft)	BORING METHOD	SOIL PROFILE: DESCRIPTION / VEGETATION:	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	RUN: NUMBER	RUN: REC / ATT	SAMPLES: NUMBER	SAMPLES: TYPE	POCKET PENETROMETER (tons/ft²)	LAB TESTS: ENVIRONMENTAL (SPLP & TOTAL METALS)	LAB TESTS: GRAIN SIZE DISTRIBUTION	NOTES WATER LEVELS
0	Geoprobe	0.0 - 2.5 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash, fine to coarse grain, black to brown, non-cohesive, moist.			583.2	1	3.60 5.00	1	GP				
		2.5 - 5.4 (SP) SAND, poorly graded, fine to medium grain, orange to tan, non-cohesive, moist.	SP		2.5 580.3			2	GP				
5		5.4 - 6.0 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash and Fly Ash, gray to black, non-cohesive, moist.			5.4 579.7			3	GP				
		6.0 - 7.8 (SP) SAND, poorly graded, fine to medium grain, tan, lenses of CCR (fly ash) at 6.6', 7.0', and 7.2', non-cohesive, moist.	SP		6.0 577.9	2	3.20 5.00	4	GP				
		7.8 - 10.0 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, with poorly graded sand, gray, non-cohesive, wet.			7.8 575.7			5	GP				8.5 ft ▼ 11/29/2017 14:50
10		10.0 - 10.2 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine to medium grain, gray, non-cohesive, wet.	SP		10.2 574.7			6	GP				
		10.2 - 11.0 (SP) SAND, poorly graded, fine to medium grain,, non-cohesive, wet.			11.0			7	GP				
		11.0 - 13.0 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine to medium grain, gray, non-cohesive, wet.			572.7	3	4.70 5.00						
		13.0 - 15.0 (SP) SAND, poorly graded, fine to medium grain, tan to gray, non-cohesive, wet.	SP		13.0 570.7			8	GP				Organics and wood debris
15		15.0 - 15.2 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, gray, with organics and wood debris, non-cohesive, wet.			15.2								
		15.2 - 20.0 (SP) SAND, poorly graded, fine to medium grain, tan to gray, non-cohesive, wet.	SP			4	3.80 5.00	9	GP				Organics and wood debris at 16.5', 17.2', and 17.4' 0.5-1" layer of organics and wood debris at 17.6' and 18.6'
20		Boring completed at 20.0 ft.			565.7								
25													

DEPTH SCALE:1 in to 3.1 ft
DRILLING CONTRACTOR: Mateco
DRILLER: Steve/John

LOGGED: HD
CHECKED: MMJ
DATE: 12/13/2017

Golder Associates

DUL_BOREHOLE (BC ASH POND) 1667572.0004 BC COBB POND 0-8 INVESTIGATION.GPJ DUL.GOLDER.GDT 12/19/17

RECORD OF BOREHOLE BCC-G17-BH-30

SHEET 1 of 1

PROJECT: BC Cobb Pond 0-8 Invest.
PROJECT NUMBER: 1667572.0004
LOCATION: S end of Ponds 2 and 3 interior berm
CLIENT: Consumers Energy Company

DRILLING METHOD: GeoProbe
DRILLING DATE: 11/29/2017
DRILL RIG: Geo 6620DT

DATUM: NAVD88
AZIMUTH: ---
NAD83 MI PLANE-S COORDS: N 646581.28, E 12622794

GS ELEVATION (ft): 585.0
TOC ELEVATION: ---

DEPTH (ft)	BORING METHOD	SOIL PROFILE: DESCRIPTION / VEGETATION:	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	RUN: NUMBER	RUN: REC / ATT	SAMPLES: NUMBER	SAMPLES: TYPE	POCKET PENETROMETER (tons/ft²)	LAB TESTS: ENVIRONMENTAL (SPLP & TOTAL METALS)	LAB TESTS: GRAIN SIZE DISTRIBUTION	NOTES WATER LEVELS
0	Geoprobe	0.0 - 2.0 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash, fine to coarse grain, black to reddish brown, non-cohesive, dry.			583.0			1	GP				
		2.0 - 5.2 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, gray, non-cohesive, dry.			2.0	1	3.60 5.00	2	GP				
5					579.8								
		5.2 - 5.5 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash, fine to medium grain, black to brown, non-cohesive, moist.			579.5 5.5								
		5.5 - 10.5 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine grain, gray, non-cohesive, wet.				2	3.80 5.00	3	GP				
10					574.5			4	GP				10.3 ft 11/29/2017 14:13
		10.5 - 15.0 (SP) SAND, poorly graded, fine to medium grain, tan, trace organics and wood debris, non-cohesive, wet.	SP		10.5	3	1.30 5.00	5	GP				
15					570.0								
		15.0 - 15.4 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash and Bottom Ash, fine to medium grain, gray, non-cohesive, wet.	SP		569.6 15.6			6	GP				
		15.4 - 15.6 (SP) SAND, poorly graded, fine to medium grain, tan, non-cohesive, wet.			568.7 16.3								
		15.6 - 16.3 ORGANICS with wood debris, reddish brown, non-cohesive, wet.				4	4.00 5.00						
		16.3 - 20.0 (SP) SAND, poorly graded, fine to medium grain, tan, non-cohesive, wet.	SP					7	GP				
20					565.0								
		Boring completed at 20.0 ft.											
25													

DEPTH SCALE:1 in to 3.1 ft
DRILLING CONTRACTOR: Mateco
DRILLER: Steve/John

LOGGED: HD
CHECKED: MMJ
DATE: 12/13/2017

Golder Associates

DUL_BOREHOLE (BC ASH POND) 1667572.0004 BC COBB POND 0-8 INVESTIGATION.GPJ DUL.GOLDER.GDT 12/19/17

RECORD OF BOREHOLE BCC-G17-BH-31

SHEET 1 of 1

PROJECT: BC Cobb Pond 0-8 Invest.
PROJECT NUMBER: 1667572.0004
LOCATION: N end of Ponds 1 and 2 interior berm
CLIENT: Consumers Energy Company

DRILLING METHOD: GeoProbe
DRILLING DATE: 11/29/2107
DRILL RIG: Geo 6620DT

DATUM: NAVD88
AZIMUTH: ---
NAD83 MI PLANE-S COORDS: N 647036.9, E 12622399.3

GS ELEVATION (ft): 587.3
TOC ELEVATION: ---

DEPTH (ft)	BORING METHOD	SOIL PROFILE: DESCRIPTION	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	RUN: NUMBER	RUN: REC / ATT	SAMPLES: NUMBER	SAMPLES: TYPE	POCKET PENETROMETER (tons/ft²)	LAB TESTS: ENVIRONMENTAL (SPLP & TOTAL METALS)	LAB TESTS: GRAIN SIZE DISTRIBUTION	NOTES WATER LEVELS
0	Geoprobe	VEGETATION:			585.3								
		0.0 - 2.0 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash, fine to coarse grain, black, non-cohesive, moist.						1	GP				
		2.0 - 5.4 (SP) SAND, poorly graded, fine to medium grain, with CCR (fly ash), tan, non-cohesive, moist.	SP		2.0	1	3.30 5.00	2	GP				
5					581.9								
		5.4 - 5.7 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash, fine to medium grain, black, non-cohesive, moist.	SP		581.6 5.7			3	GP				
		5.7 - 7.0 (SP) SAND, poorly graded, fine to medium grain, with CCR (fly ash), tan, non-cohesive, moist.			580.3 7.0								
		7.0 - 10.0 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine grain, gray, non-cohesive, moist.				2	3.00 5.00	4	GP				
10					577.3								
		10.0 - 11.2 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine grain, gray, mixed with poorly graded, fine to medium grain sand, non-cohesive, moist.			10.0 576.1			5	GP				
		11.2 - 15.0 (SP) SAND, poorly graded, fine to medium grain, tan to gray, non-cohesive, moist.	SP		11.2	3	3.20 5.00	6	GP				Organics and wood debris
15					572.3								
		Boring completed at 15.0 ft.											
20													
25													

NOTES:
1. No water level observed during sampling.

DEPTH SCALE:1 in to 3.1 ft
DRILLING CONTRACTOR: Mateco
DRILLER: Steve/John

LOGGED: HD
CHECKED: MMJ
DATE: 12/13/2017

Golder Associates

DUL_BOREHOLE (BC ASH POND) 1667572.0004 BC COBB POND 0-8 INVESTIGATION.GPJ DUL.GOLDER.GDT 12/19/17

RECORD OF BOREHOLE BCC-G17-BH-32

SHEET 1 of 1

PROJECT: BC Cobb Pond 0-8 Invest.
PROJECT NUMBER: 1667572.0004
LOCATION: Middle of Ponds 1 and 2 interior berm
CLIENT: Consumers Energy Company

DRILLING METHOD: GeoProbe
DRILLING DATE: 11/29/2017
DRILL RIG: Geo 6620DT

DATUM: NAVD88
AZIMUTH: ---
NAD83 MI PLANE-S COORDS: N 646823.08, E 12622705.1

GS ELEVATION (ft): 587.0
TOC ELEVATION: ---

DEPTH (ft)	BORING METHOD	SOIL PROFILE: DESCRIPTION / VEGETATION:	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	RUN: NUMBER	RUN: REC / ATT	SAMPLES: NUMBER	SAMPLES: TYPE	POCKET PENETROMETER (tons/ft²)	LAB TESTS: ENVIRONMENTAL (SPLP & TOTAL METALS)	LAB TESTS: GRAIN SIZE DISTRIBUTION	NOTES WATER LEVELS
0	Geoprobe	0.0 - 0.7 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash, fine to coarse grain, black, non-cohesive, moist.			586.3			1	GP				
		0.7 - 1.9 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine to medium grain, gray, non-cohesive, moist.			0.7 585.1			2	GP				
		1.9 - 6.5 (SP) SAND, poorly graded, fine to medium grain, with CCR (fly ash), light brown, non-cohesive, moist.	SP		1.9	1	3.50 5.00	3	GP				Organics and wood debris
5					580.5								Organics and wood debris
		6.5 - 13.0 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine to medium grain, gray, non-cohesive, wet.			6.5	2	4.20 5.00	4	GP				
10								5	GP				10 ft 11/29/2017 11:40
		13.0 - 15.0 ORGANICS with wood debris, reddish brown, non-cohesive, wet.			574.0 13.0	3	4.40 5.00	6	GP				
15		15.0 - 15.5 (SP) SAND, poorly graded, fine to medium grain, with CCR (fly ash), gray, non-cohesive, wet.	SP		572.0 15.0 571.5								
		15.5 - 20.0 (SP) SAND, poorly graded, fine to medium grain, gray, non-cohesive, wet.	SP		15.5	4	3.70 5.00						
20		Boring completed at 15.0 ft.			567.0 20.0								
25													

DEPTH SCALE:1 in to 3.1 ft
DRILLING CONTRACTOR: Mateco
DRILLER: Steve/John

LOGGED: HD
CHECKED: MMJ
DATE: 12/13/2017

Golder Associates

DUL_BOREHOLE (BC ASH POND) 1667572.0004 BC COBB POND 0-8 INVESTIGATION.GPJ DUL.GOLDER.GDT 12/19/17

RECORD OF BOREHOLE BCC-G17-BH-33

SHEET 1 of 1

PROJECT: BC Cobb Pond 0-8 Invest.
PROJECT NUMBER: 1667572.0004
LOCATION: S end of Ponds 1 and 2 interior berm
CLIENT: Consumers Energy Company

DRILLING METHOD: GeoProbe
DRILLING DATE: 11/29/2017
DRILL RIG: Geo 6620DT

DATUM: NAVD88
AZIMUTH: ---
NAD83 MI PLANE-S COORDS: N 646622.07, E 12623003.5

GS ELEVATION (ft): 588.3
TOC ELEVATION: ---

DEPTH (ft)	BORING METHOD	SOIL PROFILE: DESCRIPTION / VEGETATION:	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	RUN: NUMBER	RUN: REC / ATT	SAMPLES: NUMBER	SAMPLES: TYPE	POCKET PENETROMETER (tons/ft²)	LAB TESTS: ENVIRONMENTAL (SPLP & TOTAL METALS)	LAB TESTS: GRAIN SIZE DISTRIBUTION	NOTES WATER LEVELS
0	Geoprobe	0.0 - 0.8 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash, fine to coarse grain, black, non-cohesive, dry.			587.5 0.8			1	GP				
		0.8 - 1.7 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash, fine to coarse grain, reddish brown, non-cohesive, moist.			586.6 1.7			2	GP				
		1.7 - 16.0 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine to medium grain, gray, non-cohesive, moist to wet.				1	4.10 5.00	3	GP				Organics and wood debris
5						2	3.30 5.00	4	GP				
10						3	4.10 5.00	5	GP				11.5 ft 11/29/2017 13:25
15						4	3.50 5.00	6	GP				
					572.3			7	GP				
		16.0 - 16.8 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine to medium grain, gray, with poorly graded, fine to medium grain sand, non-cohesive, wet.			16.0 571.5								
		16.8 - 25.0 (SP) SAND, poorly graded, fine to medium grain, tan to gray, non-cohesive, wet.	SP		16.8			8	GP				Organics and wood debris
20						5	4.00 5.00						Organics and wood debris at 21.8' and 22.2'
25		Boring completed at 25.0 ft.			563.3								

DEPTH SCALE:1 in to 3.1 ft
DRILLING CONTRACTOR: Mateco
DRILLER: Steve/John

LOGGED: HD
CHECKED: MMJ
DATE: 12/13/2017

Golder Associates

DUL_BOREHOLE (BC ASH POND) 1667572.0004 BC COBB POND 0-8 INVESTIGATION.GPJ DUL.GOLDER.GDT 12/19/17

RECORD OF BOREHOLE BCC-G17-BH-34

SHEET 1 of 1

PROJECT: BC Cobb Pond 0-8 Invest.
PROJECT NUMBER: 1667572.0004
LOCATION: N end of Ponds 0 and 1 interior berm
CLIENT: Consumers Energy Company

DRILLING METHOD: GeoProbe
DRILLING DATE: 11/29/2017
DRILL RIG: Geo 6620DT

DATUM: NAVD88
AZIMUTH: ---
NAD83 MI PLANE-S COORDS: N 647106.01, E 12622586.6

GS ELEVATION (ft): 586.4
TOC ELEVATION: ---

DEPTH (ft)	BORING METHOD	SOIL PROFILE: DESCRIPTION / VEGETATION:	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	RUN: NUMBER	RUN: REC / ATT	SAMPLES: NUMBER	SAMPLES: TYPE	POCKET PENETROMETER (tons/ft²)	LAB TESTS: ENVIRONMENTAL (SPLP & TOTAL METALS)	LAB TESTS: GRAIN SIZE DISTRIBUTION	NOTES WATER LEVELS
0	Geoprobe	0.0 - 0.8 (SP) SAND, poorly graded, reddish brown, trace organics, non-cohesive, dry.	SP		585.6			1	GP				
		0.8 - 1.1 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine to medium grain, gray, non-cohesive, moist.	SP		585.3 585.0 584.6 584.2			2	GP				
		1.1 - 1.4 (SP) SAND, poorly graded, fine to medium grain, light brown, non-cohesive, moist.			2.2	1	3.00 5.00						
		1.4 - 1.8 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine to medium grain, gray, non-cohesive, moist.						3	GP				
5		1.8 - 2.2 (SP) SAND, poorly graded, fine to medium grain, light brown, non-cohesive, moist.											
		2.2 - 5.5 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine grain, gray, non-cohesive, moist.			580.9 580.6 5.8								
		5.5 - 5.8 ORGANICS with wood debris, reddish brown, non-cohesive, moist.			580.1 6.3			4	GP				
		5.8 - 6.3 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine to medium grain, gray, non-cohesive, moist.			579.1 7.3	2	3.60 5.00	5	GP				
		6.3 - 7.3 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine to medium grain, gray, mixed with poorly graded, fine to medium grain sand, non-cohesive, moist.			578.0 8.4			6	GP				
10		7.3 - 8.4 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine grain, gray, non-cohesive, moist.	SP										
		8.4 - 11.0 (SP) SAND, poorly graded, fine to medium grain, mixed with CCR (fly ash), tan to gray, non-cohesive, moist to wet.			575.4 11.0 574.6			7	GP				
		11.0 - 11.8 (SP) SAND, poorly graded, fine to medium grain, tan, non-cohesive, wet.	SP		11.8	3	2.40 5.00	8	GP				11.1 ft ▼ 11/29/2017 10:06
		11.8 - 15.0 (SP) SAND, poorly graded, fine to medium grain, with CCR (fly ash), brown, non-cohesive, wet.			571.4			9	GP				
15		15.0 - 15.5 (SP) SAND, poorly graded, fine to medium grain, tan, non-cohesive, wet.	SP		15.0 570.9								
		15.5 - 15.7 (OL) ORGANIC SILT with sand, fine grain, low plasticity, brown, trace organics and wood debris, cohesive, wet.	OL		15.7			10	GP				
		15.7 - 20.0 (SP) SAND, poorly graded, fine to medium grain, tan, non-cohesive, wet.	SP		566.4	4	4.70 5.00	11	GP				
20		Boring completed at 20.0 ft.											
25													

DEPTH SCALE:1 in to 3.1 ft
DRILLING CONTRACTOR: Mateco
DRILLER: Steve/John

LOGGED: HD
CHECKED: MMJ
DATE: 12/13/2017

Golder Associates

DUL_BOREHOLE (BC ASH POND) 1667572.0004 BC COBB POND 0-8 INVESTIGATION.GPJ DUL.GOLDER.GDT 12/19/17

RECORD OF BOREHOLE BCC-G17-BH-35

SHEET 1 of 1

PROJECT: BC Cobb Pond 0-8 Invest.
PROJECT NUMBER: 1667572.0004
LOCATION: S end of Ponds 0 and 1 interior berm
CLIENT: Consumers Energy Company

DRILLING METHOD: GeoProbe
DRILLING DATE: 11/29/2017
DRILL RIG: Geo 6620DT

DATUM: NAVD88
AZIMUTH: ---
NAD83 MI PLANE-S COORDS: N 646841.63, E 12622967.4

GS ELEVATION (ft): 586.0
TOC ELEVATION: ---

DEPTH (ft)	BORING METHOD	SOIL PROFILE: DESCRIPTION / VEGETATION:	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	RUN: NUMBER	RUN: REC / ATT	SAMPLES: NUMBER	SAMPLES: TYPE	POCKET PENETROMETER (tons/ft²)	LAB TESTS: ENVIRONMENTAL (SPLP & TOTAL METALS)	LAB TESTS: GRAIN SIZE DISTRIBUTION	NOTES WATER LEVELS
0	Geoprobe	0.0 - 2.4 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine to medium grain, gray, non-cohesive, moist.			583.6	1	3.10 5.00	1	GP				0.5" pocket of poorly graded sand
		2.4 - 2.6 (SP) SAND, poorly graded, fine to medium grain, tan, non-cohesive, moist.	SP		2.8								
		2.6 - 2.8 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine to medium grain, gray, non-cohesive, moist.	SP					2	GP				
5		2.8 - 5.0 (SP) SAND, poorly graded, fine to medium grain, tan, non-cohesive, moist.	SP		581.0 5.0 580.5								
		5.0 - 5.5 (SP) SAND, poorly graded, fine to medium grain, mixed with CCR (fly ash), tan, non-cohesive, moist.			5.5								
		5.5 - 10.0 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine to medium grain, gray, non-cohesive, wet.				2	3.20 5.00	3	GP				
10		10.0 - 10.5 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine to medium grain, gray, mixed with poorly graded sand, non-cohesive, wet.	SP		10.0 575.5 10.5 574.8								
		10.5 - 11.2 (SP) SAND, poorly graded, fine to medium grain, tan, non-cohesive, wet.			11.4								
		11.2 - 11.4 ORGANICS with wood debris brown, non-cohesive, wet.				3	2.00 5.00	4	GP				
		11.4 - 20.0 (SP) SAND, poorly graded,, non-cohesive, wet.											
15			SP										
						4	3.50 5.00	5	GP				
20					566.0								
		Boring completed at 20.0 ft.											
25		NOTES: 1. No water level observed during sampling.											

DEPTH SCALE:1 in to 3.1 ft
DRILLING CONTRACTOR: Mateco
DRILLER: Steve/John

LOGGED: HD
CHECKED: MMJ
DATE: 12/13/2017

Golder Associates

DUL_BOREHOLE (BC ASH POND) 1667572.0004 BC COBB POND 0-8 INVESTIGATION.GPJ DUL.GOLDER.GDT 12/19/17

RECORD OF BOREHOLE BCC-G17-BH-37

SHEET 1 of 1

PROJECT: BC Cobb Pond 0-8 Invest.
PROJECT NUMBER: 1667572.0004
LOCATION: S end of Pond 5
CLIENT: Consumers Energy Company

DRILLING METHOD: GeoProbe
DRILLING DATE: 11/27/2017
DRILL RIG: Geo 6620DT

DATUM: NAVD88
AZIMUTH: ---
NAD83 MI PLANE-S COORDS: N 646263.25, E 12623544

GS ELEVATION (ft): 578.8
TOC ELEVATION: ---

DEPTH (ft)	BORING METHOD	SOIL PROFILE: DESCRIPTION / VEGETATION:	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	RUN: NUMBER	RUN: REC / ATT	SAMPLES: NUMBER	SAMPLES: TYPE	POCKET PENETROMETER (tons/ft²)	LAB TESTS: ENVIRONMENTAL (SPLP & TOTAL METALS)	LAB TESTS: GRAIN SIZE DISTRIBUTION	NOTES WATER LEVELS
0	Geoprobe	0.0 - 14.5 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash, fine to coarse grain, black, non-cohesive, dry.				1	3.90 5.00	1	GP				
5						2	2.80 5.00	2	GP				
10						3	5.00	3	GP				14 ft ▼ 11/27/2017 10:50
					564.3								
		14.5 - 15.0 (SP) SAND, poorly graded, fine to medium grain, traces of CCR (fly ash), light brown, non-cohesive, dry.	SP		14.5 563.8								
15		15.0 - 20.0 (SP) SAND, poorly graded, fine to medium grain, light gray to tan, non-cohesive, wet.	SP		15.0	4	4.20 5.00	4	GP				
					558.8								
20		Boring completed at 20.0 ft.											
25													

DEPTH SCALE:1 in to 3.1 ft
DRILLING CONTRACTOR: Mateco
DRILLER: Steve/Alex

LOGGED: HD
CHECKED: MMJ
DATE: 12/13/2017

Golder Associates

DUL_BOREHOLE (BC ASH POND) 1667572.0004 BC COBB POND 0-8 INVESTIGATION.GPJ DUL.GOLDER.GDT 12/19/17

RECORD OF BOREHOLE BCC-G17-BH-38

SHEET 1 of 1

PROJECT: BC Cobb Pond 0-8 Invest.
PROJECT NUMBER: 1667572.0004
LOCATION: W end of Pond 5 berm
CLIENT: Consumers Energy Company

DRILLING METHOD: GeoProbe
DRILLING DATE: 11/27/2017
DRILL RIG: Geo 6620DT

DATUM: NAVD88
AZIMUTH: ---
NAD83 MI PLANE-S COORDS: N 646362.72, E 12623414.9

GS ELEVATION (ft): 587.8
TOC ELEVATION: ---

DEPTH (ft)	BORING METHOD	SOIL PROFILE: DESCRIPTION / VEGETATION:	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	RUN: NUMBER	RUN: REC / ATT	SAMPLES: NUMBER	SAMPLES: TYPE	POCKET PENETROMETER (tons/ft²)	LAB TESTS: ENVIRONMENTAL (SPLP & TOTAL METALS)	LAB TESTS: GRAIN SIZE DISTRIBUTION	NOTES WATER LEVELS
0	Geoprobe	0.0 - 1.0 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash, fine to coarse grain, black, non-cohesive, dry.			586.8			1	GP				
		1.0 - 1.4 (OL) ORGANIC SILT, low plasticity, light brown, cohesive, w~PL, hard.	OL		586.4 1.4			2	GP				
		1.4 - 5.0 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine grain, trace sand, gray, non-cohesive, dry.				1	3.80 5.00	3	GP				
5					582.8								
		5.0 - 5.5 (SP) SAND, poorly graded, fine to medium grain, trace CCR (fly ash), dark brown, non-cohesive, moist.	SP		5.0 582.3 5.5			4	GP				
		5.5 - 16.2 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine to medium grain, trace sand, gray, non-cohesive, moist to wet.				2	3.30 5.00	5	GP				
10						3	5.00	6	GP				
15								7	GP				15 ft 11/27/2017 11:46
		16.2 - 16.8 ORGANICS with wood debris, black, non-cohesive, wet.			571.6 16.2 571.0			8	GP				
		16.8 - 20.0 (SP) SAND, poorly graded, fine to medium grain, tan to gray, non-cohesive, wet.	SP		16.8	4	4.50 5.00	9	GP				
20					567.8 20.0								
25		Boring completed at 25.0 ft.											

DEPTH SCALE:1 in to 3.1 ft
DRILLING CONTRACTOR: Mateco
DRILLER: Steve/Alex

LOGGED: HD
CHECKED: MMJ
DATE: 12/13/2017

Golder Associates

DUL_BOREHOLE (BC ASH POND) 1667572.0004 BC COBB POND 0-8 INVESTIGATION.GPJ DUL.GOLDER.GDT 12/19/17

RECORD OF BOREHOLE BCC-G17-BH-41

SHEET 1 of 1

PROJECT: BC Cobb Pond 0-8 Invest.
PROJECT NUMBER: 1667572.0004
LOCATION: S end of Pond 7
CLIENT: Consumers Energy Company

DRILLING METHOD: GeoProbe
DRILLING DATE: 11/27/2017
DRILL RIG: Geo 6620DT

DATUM: NAVD88
AZIMUTH: ---
NAD83 MI PLANE-S COORDS: N 646140.08, E 12623386

GS ELEVATION (ft): 591.6
TOC ELEVATION: ---

DEPTH (ft)	BORING METHOD	SOIL PROFILE: DESCRIPTION / VEGETATION:	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	RUN: NUMBER	RUN: REC / ATT	SAMPLES: NUMBER	SAMPLES: TYPE	POCKET PENETROMETER (tons/ft²)	LAB TESTS: ENVIRONMENTAL (SPLP & TOTAL METALS)	LAB TESTS: GRAIN SIZE DISTRIBUTION	NOTES WATER LEVELS
0	Geoprobe	0.0 - 5.0 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine to medium grain, black to gray, non-cohesive, moist to wet.			586.6	1	1.30 5.00	1	GP				
5		5.0 - 8.8 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine grain, gray, cohesive, wet.			5.0 582.8	2	4.80 5.00	2	GP				
		8.8 - 10.0 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine to medium grain, black to gray, cohesive, wet.			8.8 581.6			3	GP				
10		10.0 - 13.0 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine to medium grain, gray, cohesive, wet.			10.0 578.6	3	4.80 5.00	4	GP				12 ft ▼ 11/27/2017 13:57
		13.0 - 14.2 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine to medium grain, gray, laminated, non-cohesive, wet.			13.0 577.4			5	GP				
		14.2 - 15.0 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine to medium grain, gray, cohesive, wet.			14.2 576.6			6	GP				
15		15.0 - 15.9 ORGANICS with wood debris, reddish brown, non-cohesive, wet.			15.0 575.7			7	GP				
		15.9 - 20.0 (SP) SAND, poorly graded, fine to medium grain, gray to tan, non-cohesive, moist.	SP		15.9 571.6	4	3.50 5.00	8	GP				
20		Boring completed at 20.0 ft.											
25													

DEPTH SCALE:1 in to 3.1 ft
DRILLING CONTRACTOR: Mateco
DRILLER: Steve/Alex

LOGGED: HD
CHECKED: MMJ
DATE: 12/13/2017

Golder Associates

DUL_BOREHOLE (BC ASH POND) 1667572.0004 BC COBB POND 0-8 INVESTIGATION.GPJ DUL.GOLDER.GDT 12/19/17

RECORD OF BOREHOLE BCC-G17-BH-42

SHEET 1 of 1

PROJECT: BC Cobb Pond 0-8 Invest.
PROJECT NUMBER: 1667572.0004
LOCATION: N end of Pond 7
CLIENT: Consumers Energy Company

DRILLING METHOD: GeoProbe
DRILLING DATE: 11/28/2017
DRILL RIG: Marsh Master

DATUM: NAVD88
AZIMUTH: ---
NAD83 MI PLANE-S COORDS: N 646326.87, E 12623245.1

GS ELEVATION (ft): 581.8
TOC ELEVATION: ---

DEPTH (ft)	BORING METHOD	SOIL PROFILE: DESCRIPTION / VEGETATION:	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	RUN: NUMBER	RUN: REC / ATT	SAMPLES: NUMBER	SAMPLES: TYPE	POCKET PENETROMETER (tons/ft²)	LAB TESTS: ENVIRONMENTAL (SPLP & TOTAL METALS)	LAB TESTS: GRAIN SIZE DISTRIBUTION	NOTES WATER LEVELS
0	Geoprobe	0.0 - 1.8 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine grain, gray, cohesive, wet.			580.0			1	GP				
		1.8 - 2.0 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine grain, gray, trace slag, cohesive, wet.			2.0	1	2.90 5.00	2	GP				2.7 ft ▼ 11/27/2017 11:23
		2.0 - 5.0 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine to medium grain, gray, non-cohesive, wet.			576.8			3	GP				
5		5.0 - 5.2 ORGANICS with wood debris, brown, non-cohesive, wet.			5.2			4	GP				
		5.2 - 10.0 (SP) SAND, poorly graded, fine to medium grain, gray to tan, non-cohesive, wet.	SP		571.8	2	3.00 5.00	5	GP				
10		Boring completed at 10.0 ft.											
15													
20													
25													

DEPTH SCALE:1 in to 3.1 ft
DRILLING CONTRACTOR: Mateco
DRILLER: Steve/John

LOGGED: HD
CHECKED: MMJ
DATE: 12/13/2017

Golder Associates

DUL_BOREHOLE (BC ASH POND) 1667572.0004 BC COBB POND 0-8 INVESTIGATION.GPJ DUL.GOLDER.GDT 12/19/17

RECORD OF BOREHOLE BCC-G17-BH-43

SHEET 1 of 1

PROJECT: BC Cobb Pond 0-8 Invest.
PROJECT NUMBER: 1667572.0004
LOCATION: Interior berm between Ponds 7 and 8
CLIENT: Consumers Energy Company

DRILLING METHOD: GeoProbe
DRILLING DATE: 11/29/2017
DRILL RIG: Geo 6620DT

DATUM: NAVD88
AZIMUTH: ---
NAD83 MI PLANE-S COORDS: N 646223.47, E 12623248

GS ELEVATION (ft): 594.8
TOC ELEVATION: ---

DEPTH (ft)	BORING METHOD	SOIL PROFILE: DESCRIPTION	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	RUN: NUMBER	RUN: REC / ATT	SAMPLES: NUMBER	SAMPLES: TYPE	POCKET PENETROMETER (tons/ft²)	LAB TESTS: ENVIRONMENTAL (SPLP & TOTAL METALS)	LAB TESTS: GRAIN SIZE DISTRIBUTION	NOTES WATER LEVELS
0	Geoprobe	VEGETATION:			594.5			1	GP				
		0.0 - 0.3 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine grain, gray, non-cohesive, dry.			594.2			2	GP				
		0.3 - 0.6 ORGANICS with wood debris, reddish brown, non-cohesive, moist.			0.6			3	GP				
		0.6 - 2.3 (CCR) COAL COMBUSTION RESIDUALS - Bottom Ash, fine to coarse grain, black to gray, non-cohesive, moist.			592.5	1	3.20 5.00	4	GP				
		2.3 - 8.4 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine grain, gray to brown, laminated, non-cohesive, moist.			2.3								
5								5	GP				2" layer of organics and wood debris
						2	4.40 5.00						2" layer of organic silt at 6.3', 6.7', and 7.5'
					586.4								
		8.4 - 10.0 (SP) SAND, poorly graded, fine to medium grain, dark brown, trace organics, non-cohesive, moist.	SP		8.4			6	GP				
10					584.8								
		10.0 - 17.0 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine to medium grain, gray, non-cohesive, moist to wet.			10.0								
						3	3.80 5.00	7	GP				
15					577.8			8	GP				
		17.0 - 17.4 ORGANICS with wood debris, reddish brown, trace sand and silt, non-cohesive, wet.			577.4								
		17.4 - 25.0 (SP) SAND, poorly graded, fine to medium grain, tan, non-cohesive, wet.			17.4	4	5.00	9	GP				
20			SP										
						5	3.80 5.00	10	GP				
		NOTES: 1. No water level observed during sampling.											
25					569.8								
		Boring completed at 25.0 ft.											

DEPTH SCALE:1 in to 3.1 ft
DRILLING CONTRACTOR: Mateco
DRILLER: Steve/John

LOGGED: HD
CHECKED: MMJ
DATE: 12/13/2017

Golder Associates

DUL_BOREHOLE (BC ASH POND) 1667572.0004 BC COBB POND 0-8 INVESTIGATION.GPJ DUL.GOLDER.GDT 12/19/17

RECORD OF BOREHOLE BCC-G17-BH-44

SHEET 1 of 1

PROJECT: BC Cobb Pond 0-8 Invest.
PROJECT NUMBER: 1667572.0004
LOCATION: N end of Pond 8
CLIENT: Consumers Energy Company

DRILLING METHOD: GeoProbe
DRILLING DATE: 11/28/2017
DRILL RIG: Marsh Master

DATUM: NAVD88
AZIMUTH: ---
NAD83 MI PLANE-S COORDS: N 646222.61, E 12623179.1

GS ELEVATION (ft): 586.8
TOC ELEVATION: ---

DEPTH (ft)	BORING METHOD	SOIL PROFILE: DESCRIPTION / VEGETATION:	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	RUN: NUMBER	RUN: REC / ATT	SAMPLES: NUMBER	SAMPLES: TYPE	POCKET PENETROMETER (tons/ft²)	LAB TESTS: ENVIRONMENTAL (SPLP & TOTAL METALS)	LAB TESTS: GRAIN SIZE DISTRIBUTION	NOTES WATER LEVELS
0	Geoprobe	0.0 - 1.3 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine grain, gray, laminated, cohesive, wet, very soft.			585.5			1	GP				0.3 ft ▼ 11/28/2017 14:14
		1.3 - 2.0 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine to medium grain, gray, with black organics, cohesive, moist.			1.3 584.8			2	GP				
		2.0 - 8.6 (SP) SAMPLE, poorly graded, fine to medium grain, tan to gray, non-cohesive, moist.	SP		2.0	1	2.90 5.00	3	GP				Lens of black organics
5						2	4.40 5.00	4	GP				
					578.2								
		8.6 - 10.0 (SP) SAND, poorly graded, medium grain, dark gray, non-cohesive, moist.	SP		8.6 576.8			5	GP				
10		Boring completed at 10.0 ft.											
15													
20													
25													

DEPTH SCALE:1 in to 3.1 ft
DRILLING CONTRACTOR: Mateco
DRILLER: Steve/John

LOGGED: HD
CHECKED: MMJ
DATE: 12/13/2017

Golder Associates

DUL_BOREHOLE (BC ASH POND) 1667572.0004 BC COBB POND 0-8 INVESTIGATION.GPJ DUL.GOLDER.GDT 12/19/17

RECORD OF BOREHOLE BCC-G17-BH-45

SHEET 1 of 1

PROJECT: BC Cobb Pond 0-8 Invest.
PROJECT NUMBER: 1667572.0004
LOCATION: S end of Pond 8
CLIENT: Consumers Energy Company

DRILLING METHOD: GeoProbe
DRILLING DATE: 11/28/2017
DRILL RIG: Marsh Master

DATUM: NAVD88
AZIMUTH: ---
NAD83 MI PLANE-S COORDS: N 646075.85, E 12623251

GS ELEVATION (ft): 584.6
TOC ELEVATION: ---

DEPTH (ft)	BORING METHOD	SOIL PROFILE: DESCRIPTION / VEGETATION:	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	RUN: NUMBER	RUN: REC / ATT	SAMPLES: NUMBER	SAMPLES: TYPE	POCKET PENETROMETER (tons/ft²)	LAB TESTS: ENVIRONMENTAL (SPLP & TOTAL METALS)	LAB TESTS: GRAIN SIZE DISTRIBUTION	NOTES WATER LEVELS
0	Geoprobe	0.0 - 8.0 (CCR) COAL COMBUSTION RESIDUALS - Fly Ash, fine to medium grain, gray, cohesive, wet, very soft.				1	4.10 5.00	1	GP				Partially cemented layer of CCR (fly ash)
5						2	4.50 5.00	2	GP				5.1 ft ▼ 11/28/2017 13:24
					576.6								
		8.0 - 15.0 (SP) SAND, poorly graded, fine to medium grain, tan to gray, non-cohesive, wet.	SP		8.0			4 3	GP GP				Organics and wood debris 2" layer of organics and wood debris
10						3	3.70 5.00	5	GP				Organics and wood debris 2" layer of medium to coarse grain sand
15		Boring completed at 15.0 ft.			569.6								
20													
25													

DEPTH SCALE:1 in to 3.1 ft
DRILLING CONTRACTOR: Mateco
DRILLER: Steve/John

LOGGED: HD
CHECKED: MMJ
DATE: 12/13/2017

Golder Associates

DUL_BOREHOLE (BC ASH POND) 1667572.0004 BC COBB POND 0-8 INVESTIGATION.GPJ DUL.GOLDER.GDT 12/19/17

Established in 1960, Golder Associates is a global, employee-owned organization that helps clients find sustainable solutions to the challenges of finite resources, energy and water supply and management, waste management, urbanization, and climate change. We provide a wide range of independent consulting, design, and construction services in our specialist areas of earth, environment, and energy. By building strong relationships and meeting the needs of clients, our people have created one of the most trusted professional services organizations in the world.

Africa	+ 27 11 254 4800
Asia	+ 852 2562 3658
Australasia	+ 61 3 8862 3500
Europe	+ 356 21 42 30 20
North America	+ 1 800 275 3281
South America	+ 56 2 2616 2000

solutions@golder.com
www.golder.com

Golder Associates Inc.
15851 South US 27, Suite 50
Lansing, MI 48906 USA
Tel: (517) 482-2262
Fax: (517) 482-2460

Golder Associates

Engineering Earth's Development, Preserving Earth's Integrity