Consumers Energy *Memorandum*

To: Bethany Swanberg
Environmental Quality & Sustainability Department

From: Harold D. Register, Jr.
Environmental Quality & Sustainability Department

Date: May 5, 2023

Subject: JH Campbell Unit 3 Bottom Ash Pond North/South
40 CFR 257.102(c) Closure by Removal Certification

CC: Heather Prentice, Risk Management
File, Environmental Services

1.0 INTRODUCTION

CEC prepared a "Notification of Intent to Close" for the JH Campbell Unit 3 Bottom Ash Pond North/South (JHC U3 BAP) on April 17, 2017 to comply with the requirements of §257.102(g). This correspondence was subsequently placed into the operating record per §257.105(i)(7), noticed to the State Director per §257.106(i)(7) and posted to the publicly accessible website per §257.107(i)(7). Prior to the "Notification of Intent to Close," a Closure Plan (Golder, 2016) per the requirements of §257.102(b)(1)-(2) was developed for the JHC U3. Compliance documents required pursuant to §257.107 can be publicly accessed at: https://www.consumersenergy.com/community/sustainability/environment/waste-management/coal-combustion-residuals

Between April 2017 and May 2017, CCRs were removed from the JHC U3 BAP North Pond to facilitate the development and construction of tank systems to improve management of plant process wastewaters. A large concrete CCR tank system was constructed within the JHC U3 BAP North Pond footprint with the infrastructure put into service in mid-2018. Once CCR removal was completed within the North Pond of JHC U3 BAP, the subsequent stages of constructing the concrete bottom ash tank and rerouting NPDES process streams proceeded in coordination with the continued closure of the JHC U3 BAP. Excavation activities for the remainder of the bottom ash pond – JHC U3 BAP South – were conducted from September to November 2018.

Closure of the JHC U3 BAP was conducted in accordance with §257.102(c), which states:

> ***Closure by removal of CCR****. An owner or operator may elect to close a CCR unit by removing and decontaminating all areas affected by releases from the CCR unit. 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) for constituents listed in appendix IV to this part.*

This technical memorandum has been prepared to document the closure activities at the JHC U3 BAP and provide certification from a qualified professional engineer that closure of the surface impoundment has been successfully completed, per §257.102(f)(3).

2.0 COAL COMBUSTION RESIDUALS (CCR) REMOVAL

In addition to following the closure details in the JHC U3 BAP Closure Plan, removal and documentation procedures implemented for CCR Removal are described in greater detail in the *Consumers Energy J.H. Campbell Generating Facility Bottom Ash Ponds 3 N/S Closure Work Plan (Rev. 1)* (Closure Work Plan) submitted to the Michigan Department of Environmental Quality (MDEQ) on January 27, 2017. MDEQ concurred with the Work Plan in a letter dated February 23, 2017. The procedures and detail of this Closure Work Plan were necessary for acceptance by state regulators that coal ash, defined as a solid waste by state statute, had in fact been removed completely from the unit. The Michigan Department of Environment, Great Lakes, and Energy (EGLE, formerly MDEQ) did not require a solid waste operating license for JHC U3 BAP because elements of closure were initiated prior to December 28, 2018.

As described in the Closure Work Plan, the multiple lines of evidence approach used to document CCR removal provided a predictable and reliable means to objectively measure concentrations of CCR based on physical sample properties. The approach took advantage of the clear visible distinction between the color of the CCR and the color of the underlying soil documented in soil borings and during previous removal activities for beneficial reuse and pond cleanout. This visible color difference was confirmed during the CCR removal activities and documented within each of the removal verification reports.

Summarizing, CCR removal was documented based on 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; and

- Third line of evidence: quantitative colorimeter analysis at random grid nodes to confirm CCR removal.

It is noteworthy that in the performance of this work, an alternative third line of evidence was developed for a limited subset of observation nodes. The microscopic quantification of CCR content was utilized when field observations noted that some excavated areas could be influenced by subsurface soils that do not match the site-specific colorimetric curve for JHC U3 BAP. The development and application of this methodology in support of the other lines of evidence is detailed in the supporting documentation.

2.1 BOTTOM ASH POND NORTH

During March, April, and May 2017, Ryan Incorporated Central was contracted by CEC to perform excavation activities to remove CCR from Bottom Ash Pond 3N. Documentation was collected and certified by Golder in *Bottom Ash Pond 3N CCR Removal Documentation Interim Report* (Interim Report) (Attachment A) to provide lines of evidence to confirm that CCR was removed per the Closure Work Plan. During CCR removal and documentation, the following tasks were completed:

- CCR was removed by excavation until CCR was no longer visually observed on the excavation surfaces.

- Final excavation grades were compared to apparent elevations where CCR was noted in borehole logs from previous site characterizations.

- A 50-foot grid with a total of 97 nodes was established across the limits of Bottom Ash Pond 3N.

Additional documentation compiled by Golder consistent with the Closure Work Plan included photographic documentation of CCR removal, photographic documentation of grid nodes, and quantitative colorimetric analysis that confirmed that quality assurance objectives were met. The results of these initial removal activities were provided to the EGLE. Subsequently, EGLE concurred that bottom ash, which is a regulated solid waste in Michigan, had been removed in accordance with the Closure Work Plan (EGLE, 2017).

2.2 BOTTOM ASH POND SOUTH

During September, October, and November 2018, Ryan Incorporated Central was contracted by CEC to perform excavation activities to remove CCR from Bottom Ash Pond 3S. Documentation was collected and certified by Golder in *Bottom Ash Pond 3 N/S - CCR Removal Documentation Report* (Final Report) (Attachment B) to provide lines of evidence to confirm that CCR was removed per the Closure Work Plan. Golder included the work previously completed from the initial removal activity to submit a consolidated, final report documenting all activities performed for all of the work completed. During CCR removal and documentation, the following tasks were completed:

- JHC U3 BAP was dewatered by actively pumping decant water into an overflow ditch and ultimately through the National Pollutant Discharge Elimination System (NPDES) permitted outfall.

- CCR was removed by excavation until CCR was no longer visually observed on the excavation surfaces.

- Final excavation grades were compared to apparent elevations where CCR was noted in borehole logs from previous site characterizations.

- A 50-foot grid with expanding the observation network to a total of 173 nodes was established across the limits of JHC U3 BAP North and South.

The results of the final certification for the removal of CCRs documented in the Final Report were submitted for review and concurrence as required in the Closure Work Plan. EGLE concurred that bottom ash, which is a regulated solid waste in Michigan, had been removed in accordance with the Closure Work Plan (EGLE, 2019).

3.0 COMPLIANCE WITH GROUNDWATER PROTECTION STANDARDS

Per §257.102(c), closure of a CCR impoundment is not deemed complete until groundwater monitoring concentrations associated with the unit do not exceed the groundwater protection standards (GWPSs) established pursuant to §257.95(h) for Appendix IV constituents.

Results for groundwater monitoring in the initial Annual Groundwater Monitoring Report (TRC, 2018) reported boron, calcium, sulfate, and total dissolved solids observed in at least one downgradient monitoring well above background. Later, on May 2, 2018, CEC provided notification that the assessment monitoring program commenced (CEC, 2018) pursuant to §257.95 since an alternate source demonstration did not find strong enough evidence within 90

days to determine that there was another source for the observation of Appendix III constituents above background.

However, after completing resampling of Appendix III and Appendix IV parameters, establishing groundwater protection standards (GWPS) for each Appendix IV constituent, and statistically comparing results to the GWPS, it was determined that none of the Appendix IV constituents were detected at statistically significant levels above background for the JHC U3 BAP as reported in the *2018 Annual Groundwater Monitoring and Corrective Action Report* (TRC, 2019). The results from the statistical evaluation completed conclude that an assessment of corrective measures was unnecessary because a release of any Appendix IV constituent at any of the downgradient monitoring wells had not been detected. Additionally, the groundwater monitoring program would remain in assessment monitoring until closure by removal requirements had been completed.

The *2022 Annual Groundwater Monitoring and Corrective Action Report* (TRC, 2023) states that all semiannual groundwater monitoring sampling for Appendix IV constituents sampled subsequent to the entry of assessment monitoring, including those samples collected in the 2022 monitoring period, have not shown any Appendix IV constituents at any downgradient monitoring wells to be present at statistically significant levels above the GWPS in accordance with §257.95(h). Therefore, JHC BAP U3 has met the groundwater performance requirements for closure of a CCR surface impoundment based on: 1) not having groundwater monitoring concentrations exceed the groundwater protection standard, and 2) not being required to enter assessment of corrective measures, evaluate remedies, or implement corrective actions under §§257.96 through 257.98 due to releases to groundwater.

Based on the reported results in the annual groundwater monitoring reports referenced in this technical memorandum, for all groundwater monitoring locations associated with the JHC U3 BAP, concentrations of Appendix IV constituents do not exceed the GWPSs established pursuant to §257.95(h) for Appendix IV constituents, meeting the closure performance requirement per §257.102(c).

4.0 POST-CLOSURE CARE REQUIREMENTS

The post-closure care section in the CCR rule states the following: “An owner or operator of a CCR unit that elects to close a CCR unit by removing CCR as provided by §257.102(c) is not subject to the post-closure care criteria under this section.” (§257.104(a)(2)).

5.0 CONCLUSIONS

This technical memorandum presents the summary of documented observations and data collected during the field work completed for the JHC U3 BAP closure as further detailed in:

ATTACHMENT A: Golder Associates, Inc. June 2017. Bottom Ash Pond 3N CCR Removal Documentation Interim Report

ATTACHMENT B: Golder Associates, Inc. June 2019. Bottom Ash Pond 3 N/S - CCR Removal Documentation Report

As of the certification date of this report (see Section 6.0), the JHC U3 BAP will be deemed a closed CCR unit under 40 CFR §257. Accordingly, the CCR unit is not subject to post-closure care requirements or any other requirements under 40 CFR §257 of the CCR rule.

6.0 CLOSURE CERTIFICATION BY QUALIFIED PROFESSIONAL ENGINEER

I hereby certify in accordance with §257.102(f)(3) that the JH Campbell Unit 3 Bottom Ash Pond N/S (JHC U3 BAP) was closed in accordance with the requirements of §257.102(c) of the CCR rule and the written Closure Work Plan as developed under §257.102(b). To the best of my knowledge, information, and belief, the information contained herein is true and correct and this document has been prepared in accordance with generally accepted good engineering practices.

Signature

May 5, 2023
Date of Certification

Harold D. Register, Jr., P.E.
Name

6201056266
Professional Engineer Certification Number

7.0 REFERENCES

Consumers Energy Company. April 5, 2017. Notification of Intent to Initiate Closure for JH Campbell Bottom Ash Ponds Unit 3.

Consumers Energy Company. May 2, 2018. Initiation of Assessment Monitoring Program under §257.94(e)(3).

EGLE. July 18, 2017. EGLE Response to Bottom Ash Pond 3N CCR Removal Documentation Interim Report.

EGLE. October 22, 2019. Bottom Ash Pond 3 N/S CCR Removal Documentation Report, Consumers Energy JH Campbell Landfill, Ottawa County.

Golder Associates, Inc. October 2016. J.H. Campbell Generating Facility Bottom Ash Pond 3 Closure Plan, West Olive, Michigan, Pursuant to 40 CFR 257.102.

Golder Associates, Inc. January 2017. Consumers Energy J.H. Campbell Generating Facility Bottom Ash Ponds 3 N/S Closure Work Plan (Rev. 1).

TRC Environmental Corporation. January 2018. Annual Groundwater Monitoring Report, JH Campbell Power Plant, Unit 3 North and 3 South CCR Unit, West Olive, Michigan.

TRC Environmental Corporation. January 2019. 2018 Annual Groundwater Monitoring Report, JH Campbell Power Plant, Unit 3 North and 3 South CCR Unit, West Olive, Michigan.

TRC Environmental Corporation. January 2023. 2022 Annual Groundwater Monitoring and Corrective Action Report, JH Campbell Power Plant, Unit 3 North and 3 South CCR Unit, West Olive, Michigan.

Consumers Energy
Count on Us
A CMS Energy Company
Environmental Services

June 28, 2017

Tim Unseld
District Engineer
Michigan Department of Environmental Quality - OWMRP
Grand Rapids District Office
350 Ottawa Avenue, NW Unit 10
Grand Rapids, Michigan, 49503

Subject: Bottom Ash Pond 3N CCR Removal Documentation Interim Report
JH Campbell, Unit 3 North/South Bottom Ash Ponds
West Olive, Michigan

Dear Mr. Unseld,

Enclosed for your review and approval please find an electronic copy of the JH Campbell Generating Facility Bottom Ash Pond CCR Removal Documentation Interim Report. A hard copy of this report was mailed to your office on June 20th, 2017.

Please feel free to contact me at (517) 788-0282 with any questions.

Sincerely,

Consumers Energy

Bethany Swanberg

Bethany Swanberg, EIT
Environmental Services

BAP 3N CCR REMOVAL DOCUMENTATION INTERIM REPORT

J.H. CAMPBELL GENERATING FACILITY

BOTTOM ASH POND 3N CCR REMOVAL DOCUMENTATION INTERIM REPORT

Submitted To: Mr. Brad Runkel, P.E., Environmental Services
Consumers Energy Company

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

June 20, 2017 **1777605**

Golder Associates

EXECUTIVE SUMMARY

This interim documentation report has been prepared to document removal of coal combustion residuals (CCR) from Bottom Ash Pond 3N, which is the northern portion of Unit 3 North and South Bottom Ash Ponds (Bottom Ash Ponds 3N/S) at Consumers Energy Company's (CEC) J.H. Campbell Generating Facility (JH Campbell) located in West Olive, Michigan. After CCR is removed from Bottom Ash Pond 3S; this interim report will be revised to include CCR removal documentation from Bottom Ash Pond 3S, and the final CCR removal report will be certified by a professional engineer licensed in the State of Michigan.

The closure of Bottom Ash Ponds 3 N/S is necessary to facilitate the development and construction of tank systems to improve management of plant process wastewaters. A large concrete CCR tank system will be constructed over the Bottom Ash Pond 3N footprint. This infrastructure is scheduled to be operational by 2018.

Removal and documentation procedures were implemented as described in the *Consumers Energy J.H. Campbell Generating Facility Bottom Ash Ponds 3 N/S Closure Work Plan (Rev. 1)* (Closure Work Plan) submitted to the Michigan Department of Environmental Quality (MDEQ) on January 27, 2017. MDEQ concurred with the Work Plan in a letter dated February 23, 2017 and this interim report is being submitted to meet the MDEQ's request for "submittal of a final certification that all solid waste has been removed along with the supporting documentation after completion of the removal activities."

As described in the Closure Work Plan, the multiple lines of evidence approach used to document CCR removal provided a predictable and reliable means to objectively measure concentrations of CCR based on physical sample properties. The approach took advantage of the clear visible distinction between the color of the CCR and the color of the underlying soil documented in soil borings and during previous removal activities for beneficial reuse and pond cleanout. This visible color difference was confirmed during the CCR removal activities as documented herein.

During excavation operations, CCR removal was 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.

  Figure 2 provides documentation of the final base of excavation contours.

- Second line of evidence – photographic documentation including periodic photographs of CCR removal progression and photographs of excavated areas at random grid nodes.

  Appendix A, Excavation Sequence Photographic Documentation Log, and **Appendix B**, Grid Node Photographic Documentation Log, provide photographic documentation of CCR removal. Photographed grid node locations are illustrated on **Figure 4**.

- Third line of evidence - quantitative colorimetric analysis at random grid nodes to confirm CCR removal.

  Table 1, Colorimeter Results – Sampled Grid Nodes, documents confirmation of CCR removal. Sampled grid node locations are illustrated on **Figure 5**.

The removal of CCR was conducted as proposed in the Closure Work Plan except for two modifications that are described in this report as well as in the "Pond 3 North Alternative Coal Combustions Residuals Removal Documentation" letter, dated May 25, 2017 which was submitted to the MDEQ. In each case, the multiple lines of evidence approaches indicate that CCR has been removed from JH Campbell Bottom Ash Pond 3N.

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1.0 INTRODUCTION

1.1 Purpose

Consumers Energy Company (CEC) plans to close the Unit 3 North and South Bottom Ash Ponds (Bottom Ash Ponds 3 N/S) at its J.H. Campbell Generating Facility (JH Campbell) located in West Olive, Michigan. These ponds are "existing coal combustion residual (CCR) surface impoundments" which will be closed by removal of CCR in accordance with self-implementing requirements of the Coal Combustion Residual Resource Conservation and Recovery Act (RCRA) Rule (40 CFR 257 Subpart D) ("CCR RCRA Rule").

This interim report documents CCR removal from Bottom Ash Pond 3N the limits of which are depicted on Figure 3 and is being submitted to meet the Michigan Department of Environmental Quality's (MDEQ) request for "submittal of a final certification that all solid waste has been removed along with the supporting documentation after completion of the removal activities." This interim report will be revised to include CCR removal documentation from Bottom Ash Pond 3S, and the final CCR removal report will be certified by a professional engineer licensed in the State of Michigan.

The closure of Bottom Ash Ponds 3 N/S is necessary to facilitate the development and construction of tank systems to improve management of plant process wastewaters. A large concrete CCR tank system will be constructed over the Bottom Ash Pond 3N footprint. Bottom Ash Pond 3S will continue to receive process wastewater until the tank system is operational. This infrastructure is scheduled to be operational by 2018.

2.0 CCR REMOVAL AND DOCUMENTATION

Removal and documentation procedures were implemented as described in the *Consumers Energy J.H. Campbell Generating Facility Bottom Ash Ponds 3 N/S Closure Work Plan (Rev. 1)* (Closure Work Plan) submitted to MDEQ on January 27, 2017. MDEQ concurred with the Closure Work Plan in a letter dated February 23, 2017. The Closure Work Plan presents an objective standard of 95 percent CCR removal. Although the purpose of the Closure Work Plan was 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 and groundwater/surface water interface (GSI) criteria. During excavation operations, CCR removal was 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.
- Alternative line of evidence - Fill consisting of black and dark brown to gray material was encountered in one area of the pond. The dark color of this material hindered the use of colorimetry; therefore, stereomicroscopy was used to provide the third line of evidence to document the amount of CCR present in samples from this area. The removal documentation method used at this location is described in Section 2.5 of this report and additional details associated with the north facing slope of Bottom Ash Ponds 3 N/S interior berm were documented in the "Pond 3 North Alternative Coal Combustions Residuals Removal Documentation" letter, dated May 25, 2017 (Appendix C) which was submitted to the MDEQ.

2.1 Narrative Description of CCR Removal

During March, April, and May 2017, Ryan Incorporated Central was contracted by CEC to perform excavation activities to remove CCR from Bottom Ash Pond 3N. Documentation was performed by Golder Associates Inc. (Golder) to provide lines of evidence to confirm that 95 percent of the CCR was removed per the Closure Work Plan. During CCR removal and documentation, the following tasks were completed:

- Bottom Ash Pond 3N was dewatered by actively pumping decant water into the Unit 3 overflow ditch and ultimately through the Site treatment system and National Pollutant Discharge Elimination System (NPDES) permitted outfall.
- CCR was removed by excavation until CCR was no longer visually observed on the excavation surfaces.
- Final excavation grades were compared to apparent elevations where CCR was noted in borehole logs from previous site characterizations.
- A 50-foot grid with a total of 97 nodes was established across the limits of Bottom Ash Pond 3N

- Photographic documentation of excavated areas was completed at greater than 50 percent of the grid nodes.
- Quantitative colorimetric analysis was completed at greater than 25 percent of the grid nodes.

2.2 Documentation to Excavation Grades – First Line of Evidence

The first line of evidence to assess CCR removal activities was confirmation that excavations were completed to at least the elevation established as the base of CCR from existing information. The elevation of the base of CCR (proposed CCR excavation limits) was established based on a subsurface investigation completed in Bottom Ash Ponds 3 N/S in 2016. This subsurface investigation was conducted by Golder and included five borings (JHC-BH-16001, JHC-BH-16002, JHC-BH-16011, JHC-BH-16012, and JHC-BH-16013) at locations within Bottom Ash Pond 3N.

Visual observations for the presence of CCR were completed during excavation activities until CCR were no longer visible to the naked eye in the materials present on the excavation surface. As the base and side slopes of the excavation approached the proposed CCR excavation limits, the field observations were compared to the material descriptions in the boring logs to assist in selecting the limit of excavation. As indicated on **Figure 2**, the base of excavation was at or below proposed CCR excavation limits in all but two areas of the site, the northwest corner of former pond floor and the north facing slope of the Bottom Ash Ponds 3 N/S interior berm) when CCRs were no longer visible to the naked eye. These two areas of the site contained a darker brown fill material for which visual observation could not conclusively discern between native materials found throughout the remainder of the pond. Test pits were advanced to document material characteristics between the excavation surface and the proposed CCR excavation limits and to document that the native materials within these intervals contained less than five percent CCR.

2.3 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 with a total of 97 nodes was established across the limits of Bottom Ash Pond 3N for assessment of CCR removal. The grid is illustrated in **Figure 3**. Confirmation by visual assessment and photographic documentation were completed on greater than 50 percent of the grid nodes selected using a random number generator. The locations of the 50 nodes selected for photographic documentation are illustrated on **Figure 4**.

Each grid node was inspected visually to identify whether residual CCR were present on the exposed surface of the excavation. If CCR were visible, additional material was removed.

When no or only minor visible signs of CCR were observed, photographs and written descriptions were taken to document the material left in place at the 50 randomly selected grid nodes. The photography procedure was standardized such that it included the following elements:

- Photographs of the general area-wide excavation of Bottom Ash Pond 3N were taken.
- Photographs were taken of a representative sample area measuring one-square-foot that contained surficial materials present at the base of the excavation at each grid node.
- Photographs were taken from a standardized height so that the same area and level of detail is shown by each photograph.

An Excavation Sequence Photographic Documentation Log is included as **Appendix A** and a Grid Node Photographic Documentation Log documenting conditions at all photographed grid nodes is included as **Appendix B**.

2.4 Colorimetric Confirmation - Third Line of Evidence

As described in the Closure Work Plan, a colorimetric analysis method utilizing a digital colorimeter to precisely measure the color of a soil sample was developed to further verify CCR removal. The analysis was conducted in accordance with ASTM E1347, Standard Test Method for Color and Color-Difference Measurement by Tristimulus Colorimetry. The method involved measuring color values for a field sample and converting these values into a color-concentration calibration curve to determine the amount of CCR in the sample.

A Konica-Minolta CR-400 colorimeter and site-specific color-concentration calibration curve (prepared using samples collected prior to CCR removal) were brought to the field for sample analysis. One minor clarification to the methodology presented in the Closure Work Plan was made during field implementation. If the CCR content of a sample was measured in the range of 4.5 percent to 5.5 percent, the sample would be tested three additional times using the remaining portion of the sample, split three times. This repeated sub-sampling and analysis would result in the testing of four splits of a sample, from which the average CCR content would be reported. As indicated in Table 1, Colorimeter Results – Sampled Grid Nodes, sub-sampling was only conducted at one location, Grid Node 75. The remainder of the grid node colorimetry analyses yielded results of 4.5 percent or less CCR.

After photographic documentation was completed, soil samples were collected from the base of the excavation at randomly selected grid nodes using the same grid node selection methodology developed for the photographic documentation (i.e., colorimetric confirmation was conducted at 25 percent of the total grid nodes, 50 percent of the photographed nodes). The 25 nodes selected for photographic documentation and colorimetric confirmation are illustrated on **Figure 5**. Colorimetric confirmation results for each sampled grid node are included in **Table 1**. All sampled grid nodes passed colorimetric

confirmation. Colorimeter calibration results, which were recorded daily during the colorimetric confirmation activities, are summarized in **Table 2**.

2.5 Modifications to Closure Work Plan

There were two areas where modifications of the Closure Work Plan were required during the documentation process: one in the northwest corner of former pond floor and the other along the north facing slope of Bottom Ash Ponds 3 N/S interior berm.

2.5.1 Northwest Corner of Former Pond Floor

Based on visual observations during excavation, the base of CCR was encountered at an elevation of 599.5 feet (NGVD29), plant datum in the northwest corner of former pond floor. The depth of the base of CCR in this area had previously been estimated at 598.8 feet (NGVD29) based on samples collected from boring JHC-BH-16001 completed in May 2016. To document conditions at the proposed CCR excavation limits, a dozer was used to excavate an additional one foot of soil at the approximate location of boring JHC-BH-16001. The location of the excavated area is illustrated on **Figure 3**. No CCR was observed at the base of the excavation in this area; consequently, a photograph was taken of the base of the excavated area, and a sample was collected for color confirmation. The photograph is included as the last photograph in **Appendix A**, and the colorimeter result is included in **Table 1**. The sample collected at this location contain less than five percent CCR.

2.5.2 Bottom Ash Pond 3N Southern Limit of Excavation

During excavation along the interior berm of Bottom Ash Ponds 3 N/S (i.e., the berm that divides Bottom Ash Pond 3 N from Bottom Ash Pond 3 S), a thin layer of what appeared to be fill consisting of dark brown to gray silty sand, silt, and clay with some black organics was encountered. The material did not have the visual appearance or characteristics of the CCR being removed from the surrounding areas. Therefore, field personnel questioned whether the material met the criteria for removal. The field personnel also noted that complete removal of this layer, including where it was inferred to extend to the south, would require the removal of 9,300 cubic yards of clean sand above it, which would have to be replaced to maintain the integrity of Bottom Ash Pond 3S.

A review of the design plans and boring logs indicated that the material encountered was likely the same material encountered at approximate elevations of 618 to 620 feet (NGVD29) in previously advanced borings Pond 3B-4 and SB-1503. The test pit locations are illustrated on **Figure 6**. Boring logs are included in **Appendix C**, Pond 3 North Alternative Coal Combustions Residuals Removal Documentation letter, dated May 25, 2017. The material in boring Pond 3B was described as “dark brown to gray sandy ASH, trace cinders” and was underlain by sand that included “trace gravel and organics.”

Four test pits were dug into the north face of the center berm to facilitate collection of samples to evaluate whether CCR were present in the apparent fill material. The test pits were advanced in locations that would provide reasonable access for sampling and photography. The south berm slopes from the approximate elevation of 617 feet (NGVD29), where the apparent layer of fill was encountered to a top of berm elevation of approximately 630 feet (NGVD29). Test pits further up the slope would have been dug to depths making them inaccessible for photography and would have limited sampling to backhoe bucket samples. The selected locations provided access to the layer for hand sampling and photography. Mr. Timothy Unseld, Environmental Engineer, Waste Management and Radiological Protection Division, MDEQ was contacted, came to the site and observed conditions in and around the test pits.

Test pit logs were prepared to document field conditions, provide the locations and horizontal and vertical extents of the test pits and samples collected, and document descriptions of the materials encountered in the test pits. Photographs were taken of the test pits and sampled material. The test pit logs and photographs are included in **Appendix C**. Field sample descriptions are also included in **Table 4**. Based on the description of the material encountered in the field, it was concluded that the material that was described in boring Pond 3B as gray sandy ASH was likely the dark brown/gray sand with clay observed in test pit 3078.

The collected samples were split, dried, and examined under a microscope. The CCR content in each sample was enumerated on a percentage basis based on the microscopic identification and point-counting analysis and compared to a premixed standard. Quantitative colorimeter analyses were not practicable for these samples due to the dark organics and other material present in the samples, which made them inappropriate for comparison to the calibration curve that was developed using native sand and CCR samples. The sample descriptions and CCR content for each sample are included on **Table 3**.

Samples from each test pit were submitted to Wiss, Janney, Elstner Associates, Inc. (WJE) laboratory in Northbrook, Illinois for additional laboratory analysis. In the laboratory, CCR content was determined using a stereomicroscope. Laboratory results are documented in a May 3, 2017 memorandum from WJE to Golder (included in **Appendix C**) and are summarized in **Table 4**, which includes a comparison of the field and laboratory results. The laboratory results confirm the CCR content of less than five percent in the four samples analyzed.

The test data indicate that the dark-colored materials encountered in the test pits comprise clays, organics, and other miscellaneous fill materials that contain less than five percent CCR, and therefore do not meet the criteria for removal. CEC submitted a “Pond 3 North Alternative Coal Combustions Residuals Removal Documentation” letter to MDEQ, dated May 25, 2017 (Appendix C). This letter contains a memorandum from Golder that detailed the multiple lines of evidence approach used to document the material did not contain >5% CCR in conformance with the Closure Work Plan. This

includes the use of stereomicroscopy, which was discussed as a valid means of measuring CCR in the Closure Work Plan, to replace the colorimetric analysis. Furthermore, WJE prepared a memorandum detailing their method of determining CCR concentrations via laboratory microscopy, which includes photographic evidence that CCR particles are clearly distinguished by their shape, color, and glassy appearance. The following three lines of evidence were used to document conditions associated with the miscellaneous fill layer in the north facing slope:

- Test pits extended to grades of anticipated elevations of CCR from previous site characterizations (in lieu of final excavation grades compared to known elevations of CCR from previous site characterizations as proposed in the work plan)
- Test pits and sampled material documented with photographs (to provide photographic documentation of excavated areas as proposed in the work plan)
- Microscopic estimates of the CCR content (in lieu of quantitative colorimetric analysis as proposed in the work plan)

Removal of CCR from the remainder of the south slope was documented as presented in the Closure Work Plan.

3.0 SUMMARY

CCR removal and documentation procedures were implemented as described in the Closure Work Plan submitted to the MDEQ on January 27, 2017 and in the MDEQ concurrence letter dated February 23, 2017. Where the proposed lines of evidence to support CCR removal were not documentable, modified lines of evidence to support CCR removal were documented as described in Section 2.4 of this interim report as well as the "Pond 3 North Alternative Coal Combustions Residuals Removal Documentation" letter, dated May 25, 2017. The multiple lines of evidence indicate that CCR has been removed from JH Campbell Bottom Ash Pond 3N.

As described in the Closure Work Plan, the multiple lines of evidence approach provided a predictable and reliable means to objectively measure concentrations of CCR based on physical sample properties and confirmed that the materials remaining on the base of the excavation contained no visually identifiable CCR and documented at least 95 percent CCR removal when tested by colorimetric or microscopic methods.

During excavation operations, CCR removal was 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.

  Figure 2 provides documentation of the final base of excavation contours.

- Second line of evidence – photographic documentation including periodic photographs of CCR removal progression and photographs of excavated areas at random grid nodes.

  Appendix A, Excavation Sequence Photographic Documentation Log, and **Appendix B**, Grid Node Photographic Documentation Log, provide photographic documentation of CCR removal. Photographed grid node locations are illustrated on **Figure 4**.

- Third line of evidence - quantitative colorimetric analysis at random grid nodes to confirm CCR removal.

  Table 1, Colorimeter Results – Sampled Grid Nodes, documents confirmation of CCR removal. Sampled grid node locations are illustrated on **Figure 5**.

4.0 CERTIFICATION OF CCR REMOVAL

This interim report is being submitted to meet the MDEQ's request for "submittal of a final certification that all solid waste has been removed along with the supporting documentation after completion of the removal activities." After CCR is removed and documented from Bottom Ash Pond 3S, this interim report will be revised to include the northern and southern portions of the Bottom Ash Pond 3 CCR Unit and certified by a professional engineer in the State of Michigan.

GOLDER ASSOCIATES INC.

Mark A. Bergeon, P.G.
Program Leader and Associate

Jeff Piaskowski, P.E.
Senior Engineer

MAB/ls

5.0 REFERENCES

Standards for the Disposal of Coal Combustion Residuals in Landfills and Surface Impoundments, Code of Federal Record Title 40 Part 257 Subpart D, United States Environmental Protection Agency, July 2015

Consumers Energy JH Campbell Generating Facility Bottom Ash Ponds 3 N/S Closure Work Plan (Rev. 1), Consumers Energy, January 2017

TABLES

CEC J.H. Campbell Pond 3N
Pond 3N CCR Removal
Golder Project No. 1777605

TABLE 1: Colorimeter Results - Sampled Grid Nodes						
Node/Location	Northing	Easting	Date Sampled	Color Value (RGB integer)	**CCR (%)**	**Pass/ Fail (less than 5%)**
19	450	2100	4/21/2017	11042647.13	**2.36**	**Pass**
21	550	2100	4/11/2017	11368698.56	**0.00**	**Pass**
27	850	2100	4/27/2017	10995395.26	**2.70**	**Pass**
36	400	2150	4/27/2017	11156685.54	**1.53**	**Pass**
42	700	2150	4/12/2017	10981394.83	**2.80**	**Pass**
44	800	2150	4/26/2017	10934517.05	**3.14**	**Pass**
59	650	2200	4/13/2017	10820469.41	**3.96**	**Pass**
61	750	2200	4/12/2017	11132703.00	**1.71**	**Pass**
62	800	2200	4/26/2017	11379298.9	**0.00**	**Pass**
63	850	2200	4/26/2017	11231183.92	**0.99**	**Pass**
75A	550	2250	4/13/2017	10615760.27	5.44	**Pass**
75B	550	2250	4/13/2017	10745414.56	4.51	
75C	550	2250	4/13/2017	10740981.12	4.54	
75D	550	2250	4/13/2017	10739190.56	4.55	
75 Average *	550	2250	4/13/2017	10710336.63	**4.76**	
98	800	2300	4/26/2017	11280366.81	**0.64**	**Pass**
110	500	2350	5/2/2017	10830765.62	**3.89**	**Pass**
111	550	2350	4/18/2017	11187648.36	**1.31**	**Pass**
114	700	2350	4/18/2017	11267293.93	**0.73**	**Pass**
116	800	2350	4/26/2017	11154188.51	**1.55**	**Pass**
117	850	2350	4/26/2017	11188240.87	**1.30**	**Pass**
133	750	2400	4/18/2017	11346285.27	**0.16**	**Pass**
134	800	2400	4/26/2017	11320673.43	**0.35**	**Pass**
145	500	2450	5/2/2017	11122970.41	**1.78**	**Pass**
146	550	2450	4/19/2017	11437070.75	**0.00**	**Pass**
148	650	2450	4/14/2017	10983509.04	**2.79**	**Pass**
149	700	2450	4/14/2017	11177655.84	**1.38**	**Pass**
160	450	2500	4/27/2017	11069778.75	**2.16**	**Pass**
162	550	2500	4/20/2017	11200806.76	**1.21**	**Pass**
169	650	2550	4/27/2017	11108640.73	**1.88**	**Pass**
172	800	2550	4/21/2017	11271384.88	**0.70**	**Pass**
173	850	2550	4/21/2017	11122408.99	**1.78**	**Pass**
JHC BH-16001**	679	2185	4/18/2017	11032189.64	***2.43***	**Pass**

* If a sample yielded a percent CCR between 4.5% and 5.5%, three additional splits of the sample were analyzed (A, B, C, and D are separately tested splits of the sample). The average of the four results were reported as the percent CCR for the node.

CEC J.H. Campbell
1777605 Pond 3N CCR Removal
Golder Project No. 1777605

TABLE 2: Colorimeter Calibration Summary				
Date Sampled	CCR (known mass)	Color Value (RGB interger)	CCR (%)	Difference
4/13/2017	3.68	10825720.12	3.93	0.25
4/14/2017	5	10678179.45	4.99	-0.01
4/17/2017	5	10607751.71	5.50	0.50
4/18/2017	5	10701651.69	4.82	-0.18
4/19/2017	5	10630175.95	5.34	0.34
4/20/2017	5	10622465.43	5.40	0.40
4/21/2017	5	10654051.62	5.17	0.17
4/25/2017	5	10666050.5	5.08	0.08
4/26/2017	5	10630139.9	5.34	0.34
4/27/2017	5	10633558.85	5.32	0.32
5/2/2017	5	10631851.22	5.33	0.33

CEC J.H. Campbell
1777605 Pond 3N CCR Removal
Golder Project No. 1777605

TABLE 3: Colorimeter Results - Test Pits							
Test Pit	Northing	Easting	Date Sampled	Color Value (RGB integer)	Colorimeter Results of CCR (%)	**Field Microscopic Estimation of CCR (%)**	**Pass/ Fail (less than 5%)**
3075	461.288	2216.483	4/25/2017	11019000.92	2.53	**2-3**	**Pass**
3076*	468.194	2171.272	4/25/2017	10704427.54	*	**2-3**	**Pass**
3077*	473.928	2395.799	4/25/2017	10264656.85	*	**3-5**	**Pass**
3078*	467.148	2462.118	4/25/2017	9846127.15	*	**1-2**	**Pass**

* Quantitative colorimeter analyses were not practicable for these samples due to the dark organics and other material present in the samples which made them inappropriate for comparison to the colorimeter curve calculated using brown sand and CCR samples.

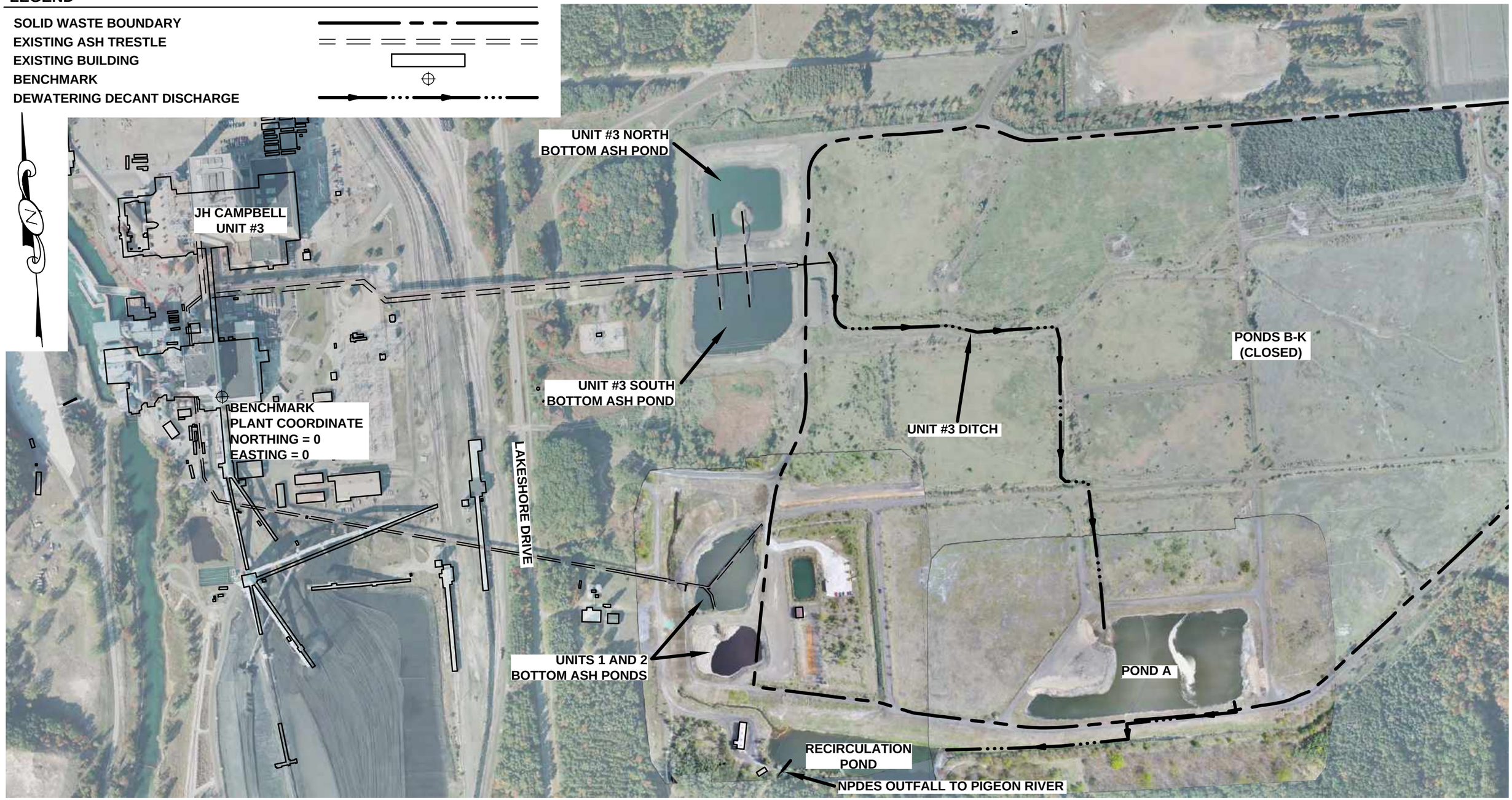
CEC J.H. Campbell
1777605 Pond 3N CCR Removal
Golder Project No. 1777605

TABLE 4: Ponds 3 N/S Interior Berm Test Pit Summary										
Test Pit	Northing	Easting	Date Sampled	Top Elevation	Bottom Elevation	Layer/Sample Elevation	Field Sample Description	% CCR by Microscopy		Pass/ Fail (less than 5%)
								Field	Lab	
3075	461.288	2216.483	4/25/2017	621	613	N/A	Brown sand, trace clay	**2 - 3**	**2.6**	**Pass**
3076*	468.194	2171.272	4/25/2017	625	613	615	Dark brown sand with silt, trace CCR	**2 - 3**	**2.9**	**Pass**
3077*	473.928	2395.799	4/25/2017	623	612	618	Dark brown silty sand, trace gravel, trace organics, 4-inch fragment of dark gray to black asphaltic cement, trace CCR	**3 - 5**	**3.8**	**Pass**
3078*	467.148	2462.118	4/25/2017	626	614	616	Dark brown/gray sand with clay, trace organics	**1 - 2**	**2.3**	**Pass**

FIGURES

LEGEND

- SOLID WASTE BOUNDARY
- EXISTING ASH TRESTLE
- EXISTING BUILDING
- BENCHMARK
- DEWATERING DECANT DISCHARGE



REV	DATE	DESCRIPTION	BY	CHK	APP
	05-31-17	ISSUED FOR FINAL REPORT	DJS	HAD	MAB
	05-12-17	ISSUED FOR DRAFT REPORT	DJS	HAD	MAB

SIGNATURE

NAME

MICHIGAN P.E. NO.

Consumers Energy

J.H. CAMPBELL ASH STORAGE FACILITY

JH CAMPBELL BOTTOM ASH POND 3N

SITE OVERVIEW

SCALE	1" = 400'	DRAWING NO.	FIGURE	REV.
JOB			1	

NOTES

1. COORDINATES SHOWN ARE ON THE J.H. CAMPBELL LOCAL PLANT DATUM
2. ELEVATIONS SHOWN ARE ON THE J.H. CAMPBELL LOCAL PLANT DATUM (NGVD 29).
3. EXCAVATED CONTOURS SHOWN ARE FROM THE APRIL 17, 2017 THROUGH THE MAY 3, 2017 SURVEYS.
4. DATA USED TO ESTABLISH DESIGN ELEVATION FOR BASE OF CCR:

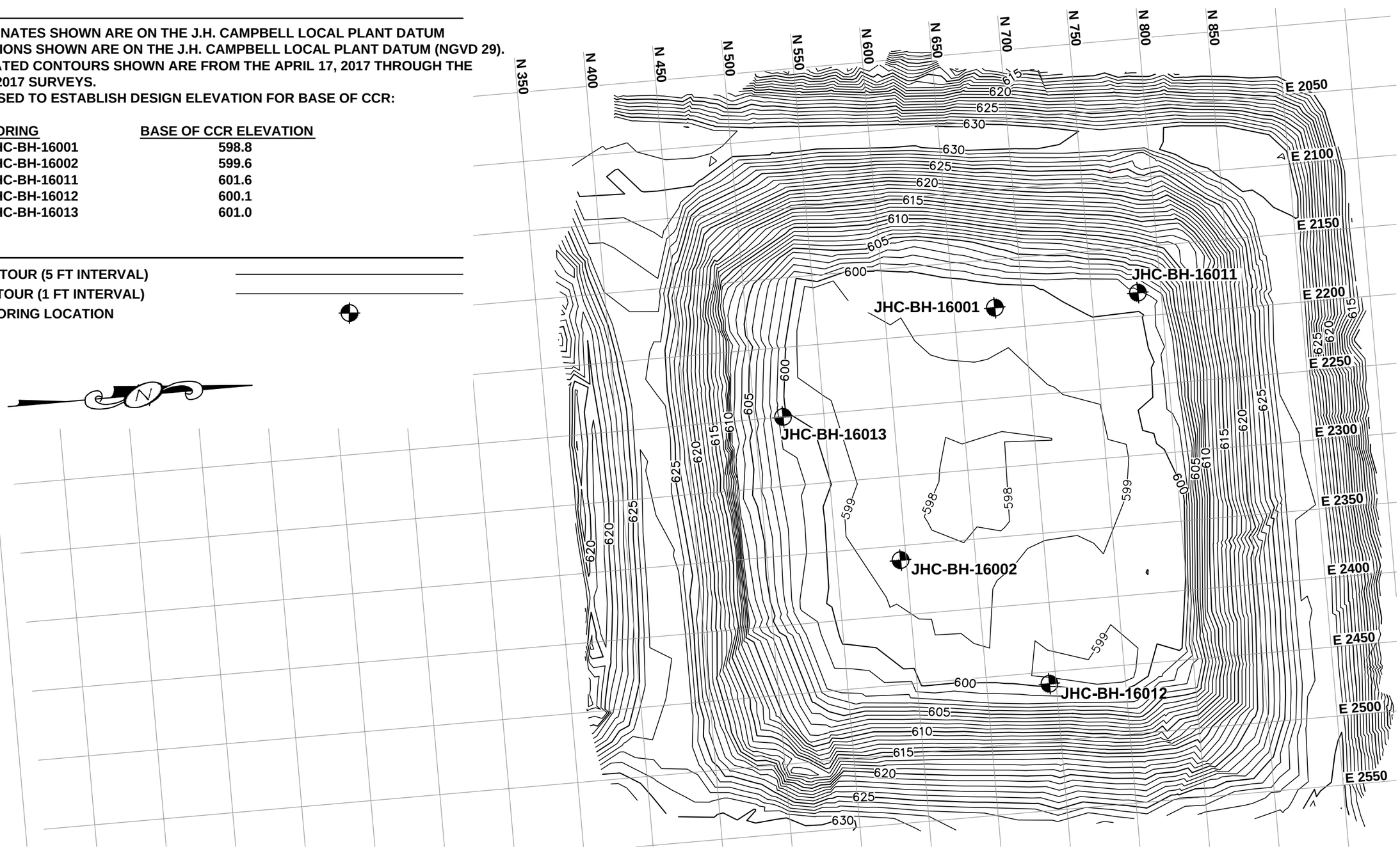
BORING	BASE OF CCR ELEVATION
JHC-BH-16001	598.8
JHC-BH-16002	599.6
JHC-BH-16011	601.6
JHC-BH-16012	600.1
JHC-BH-16013	601.0

LEGEND

MAJOR CONTOUR (5 FT INTERVAL)

MINOR CONTOUR (1 FT INTERVAL)

2016 SOIL BORING LOCATION



REV	DATE	DESCRIPTION	BY	CHK	APP
	05-31-17	ISSUED FOR FINAL REPORT	DJS	HAD	MAB
	05-12-17	ISSUED FOR DRAFT REPORT	DJS	HAD	MAB

SIGNATURE

NAME

MICHIGAN P.E. NO.

Consumers Energy

J.H. CAMPBELL ASH STORAGE FACILITY

JH CAMPBELL BOTTOM ASH POND 3N

CCR REMOVAL DOCUMENTATION - BASE OF EXCAVATION

SCALE	1" = 70'	DRAWING NO.	FIGURE	REV.
JOB			2	

NOTES

1. COORDINATES SHOWN ARE ON THE J.H. CAMPBELL LOCAL PLANT DATUM
2. ELEVATIONS SHOWN ARE ON THE J.H. CAMPBELL LOCAL PLANT DATUM (NGVD 29).
3. EXCAVATED CONTOURS SHOWN ARE FROM THE APRIL 17, 2017 THROUGH THE MAY 3, 2017 SURVEYS.

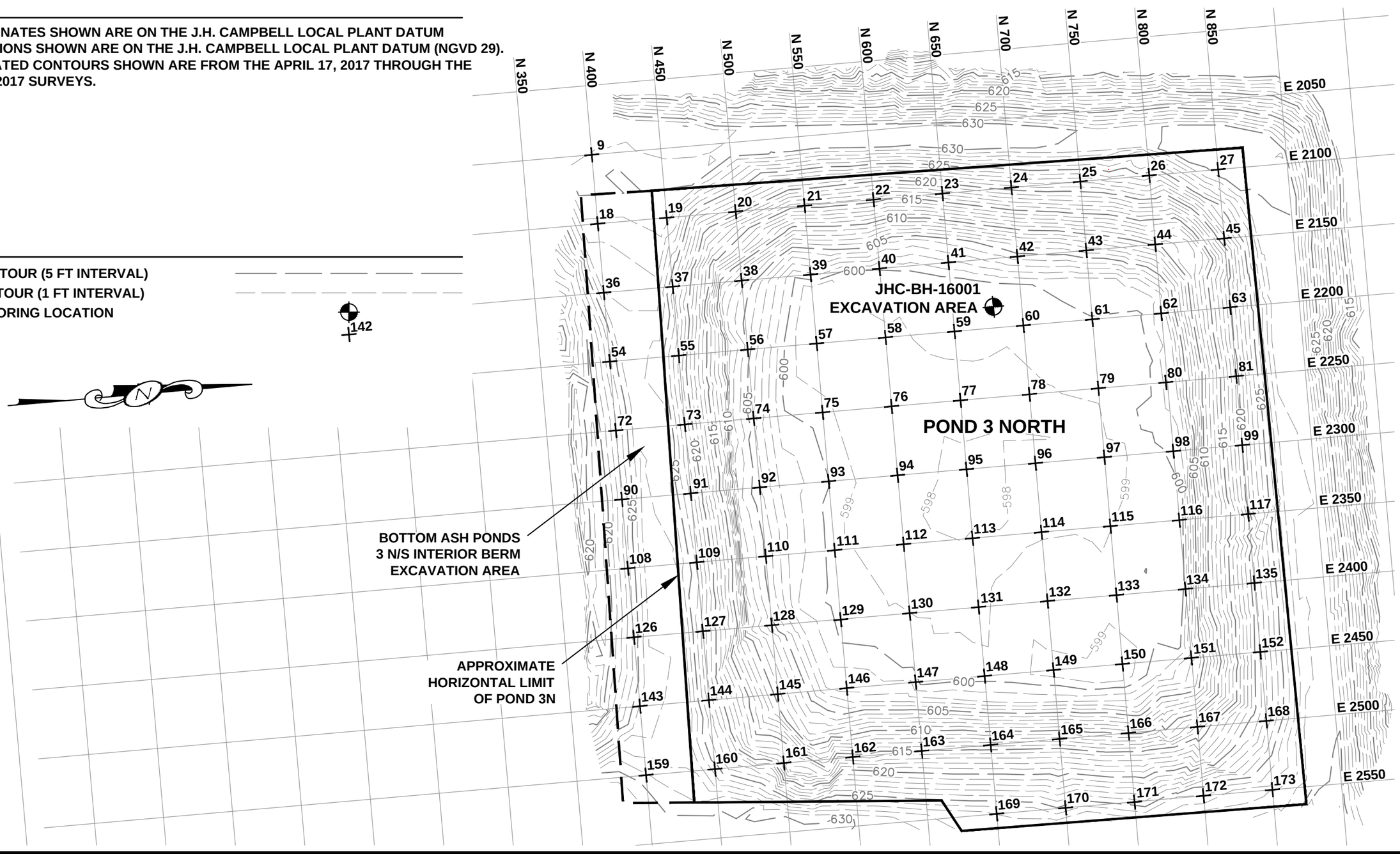
LEGEND

MAJOR CONTOUR (5 FT INTERVAL)

MINOR CONTOUR (1 FT INTERVAL)

2016 SOIL BORING LOCATION

GRID NODE



REV	DATE	DESCRIPTION	BY	CHK	APP
	05-31-17	ISSUED FOR FINAL REPORT	DJS	HAD	MAB
	05-12-17	ISSUED FOR DRAFT REPORT	DJS	HAD	MAB

SIGNATURE

NAME

MICHIGAN P.E. NO.

Consumers Energy

J.H. CAMPBELL ASH STORAGE FACILITY

JH CAMPBELL BOTTOM ASH POND 3N

CCR REMOVAL DOCUMENTATION - SAMPLE GRID

SCALE	1" = 70'	DRAWING NO.	FIGURE	REV.
JOB			3	

NOTES

1. COORDINATES SHOWN ARE ON THE J.H. CAMPBELL LOCAL PLANT DATUM
2. ELEVATIONS SHOWN ARE ON THE J.H. CAMPBELL LOCAL PLANT DATUM (NGVD 29).
3. EXCAVATED CONTOURS SHOWN ARE FROM THE APRIL 17, 2017 THROUGH THE MAY 3, 2017 SURVEYS.

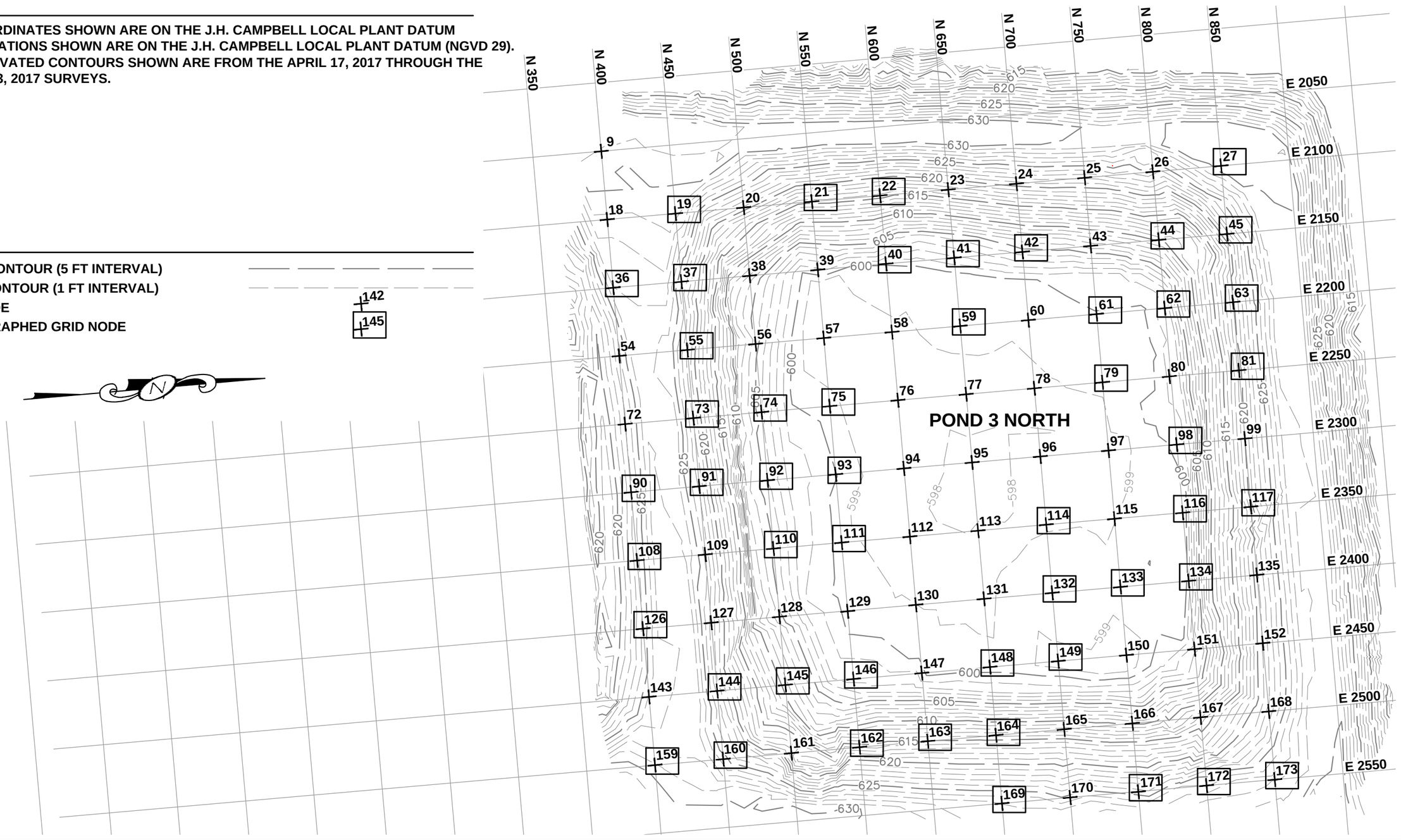
LEGEND

MAJOR CONTOUR (5 FT INTERVAL)

MINOR CONTOUR (1 FT INTERVAL)

GRID NODE 142

PHOTOGRAPHED GRID NODE 145



REV	DATE	DESCRIPTION	BY	CHK	APP
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	05-12-17	ISSUED FOR DRAFT REPORT	DJS	HAD	MAB

SIGNATURE

NAME

MICHIGAN P.E. NO.

Consumers Energy

J.H. CAMPBELL ASH STORAGE FACILITY

JH CAMPBELL BOTTOM ASH POND 3N

CCR REMOVAL DOCUMENTATION - PHOTOGRAPHED GRID NODES

SCALE	1" = 70'	DRAWING NO.	FIGURE	REV.
JOB			4	

NOTES

1. COORDINATES SHOWN ARE ON THE J.H. CAMPBELL LOCAL PLANT DATUM
2. ELEVATIONS SHOWN ARE ON THE J.H. CAMPBELL LOCAL PLANT DATUM (NGVD 29).
3. EXCAVATED CONTOURS SHOWN ARE FROM THE APRIL 17, 2017 THROUGH THE MAY 3, 2017 SURVEYS.

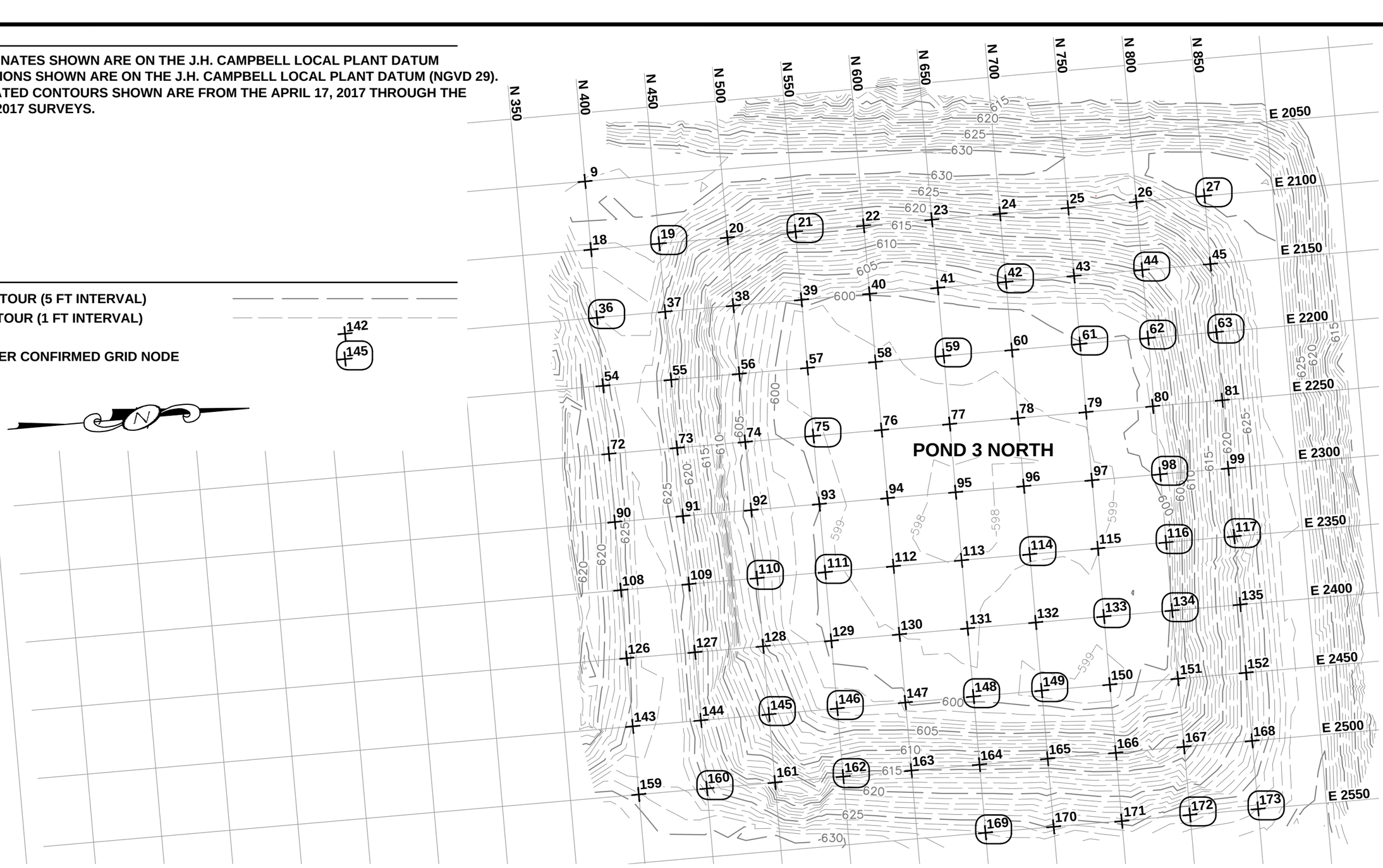
LEGEND

MAJOR CONTOUR (5 FT INTERVAL)

MINOR CONTOUR (1 FT INTERVAL)

GRID NODE

COLORIMETER CONFIRMED GRID NODE



REV	DATE	DESCRIPTION	BY	CHK	APP
	05-31-17	ISSUED FOR FINAL REPORT	DJS	HAD	MAB
	05-12-17	ISSUED FOR DRAFT REPORT	DJS	HAD	MAB

SIGNATURE

NAME

MICHIGAN P.E. NO.

Consumers Energy

J.H. CAMPBELL ASH STORAGE FACILITY

JH CAMPBELL BOTTOM ASH POND 3N

CCR REMOVAL DOCUMENTATION - COLORIMETER CONFIRMED GRID NODES

SCALE	1" = 70'	DRAWING NO.	FIGURE	REV.
JOB			5	

NOTES

1. COORDINATES SHOWN ARE ON THE J.H. CAMPBELL LOCAL PLANT DATUM
2. ELEVATIONS SHOWN ARE ON THE J.H. CAMPBELL LOCAL PLANT DATUM (NGVD 29).
3. EXCAVATED CONTOURS SHOWN ARE FROM THE APRIL 17, 2017 THROUGH THE MAY 3, 2017 SURVEYS.

LEGEND

MAJOR CONTOUR (5 FT INTERVAL)

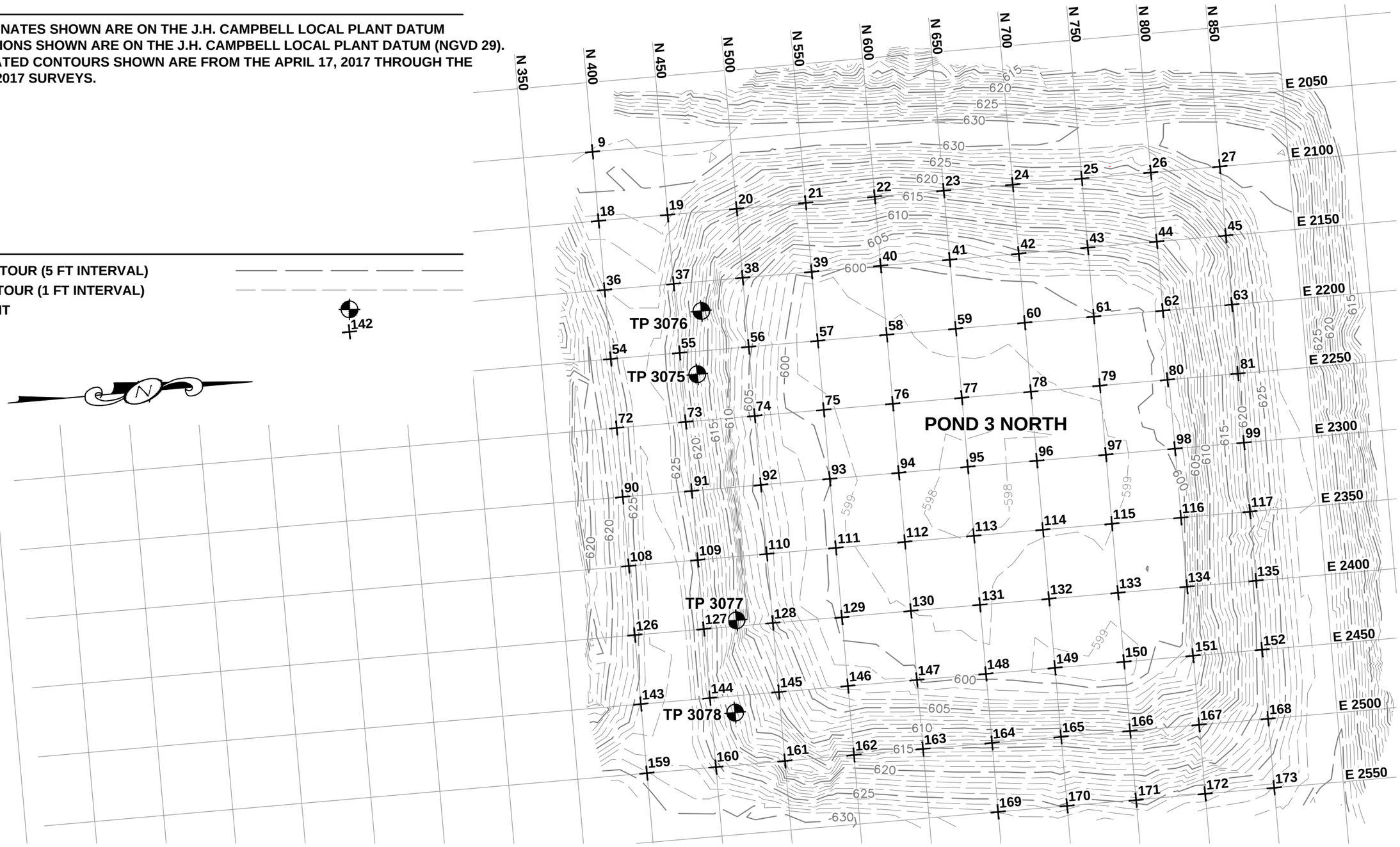
MINOR CONTOUR (1 FT INTERVAL)

2017 TEST PIT

GRID NODE

142

N



REV	DATE	DESCRIPTION	BY	CHK	APP
	05-31-17	ISSUED FOR FINAL REPORT	DJS	HAD	MAB
	05-12-17	ISSUED FOR DRAFT REPORT	DJS	HAD	MAB

SIGNATURE

NAME

MICHIGAN P.E. NO.

Consumers Energy

J.H. CAMPBELL ASH STORAGE FACILITY

JH CAMPBELL BOTTOM ASH POND 3N

CCR REMOVAL DOCUMENTATION - TEST PITS

SCALE	1" = 70'	DRAWING NO.	FIGURE	REV.
JOB			6	

APPENDIX A
EXCAVATION SEQUENCE PHOTOGRAPHIC DOCUMENTATION LOG

CEC J.H. Campbell Pond 3 North Excavation Sequence Photo Log

Orientation: Looking west.

CEC J.H. Campbell Pond 3 North Excavation Sequence Photo Log

Orientation: Looking west.

CEC J.H. Campbell Pond 3 North Excavation Sequence Photo Log

Orientation: Looking west.

CEC J.H. Campbell Pond 3 North Excavation Sequence Photo Log

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CEC J.H. Campbell Pond 3 North Excavation Sequence Photo Log

Orientation: Looking west.

CEC J.H. Campbell Pond 3 North Excavation Sequence Photo Log

Orientation: Looking west.

CEC J.H. Campbell Pond 3 North Excavation Sequence Photo Log

Orientation: Looking northwest.

CEC J.H. Campbell Pond 3 North Excavation Sequence Photo Log

Orientation: Looking northwest.

CEC J.H. Campbell Pond 3 North Excavation Sequence Photo Log

Orientation: Looking northwest.

CEC J.H. Campbell Pond 3 North Excavation Sequence Photo Log

Orientation: Looking northwest.

CEC J.H. Campbell Pond 3 North Excavation Sequence Photo Log

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CEC J.H. Campbell Pond 3 North Excavation Sequence Photo Log

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CEC J.H. Campbell Pond 3 North Excavation Sequence Photo Log

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CEC J.H. Campbell Pond 3 North Excavation Sequence Photo Log

Orientation: Looking northwest.

CEC J.H. Campbell Pond 3 North Excavation Sequence Photo Log

Orientation: Looking north.

CEC J.H. Campbell Pond 3 North Excavation Sequence Photo Log

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CEC J.H. Campbell Pond 3 North Excavation Sequence Photo Log

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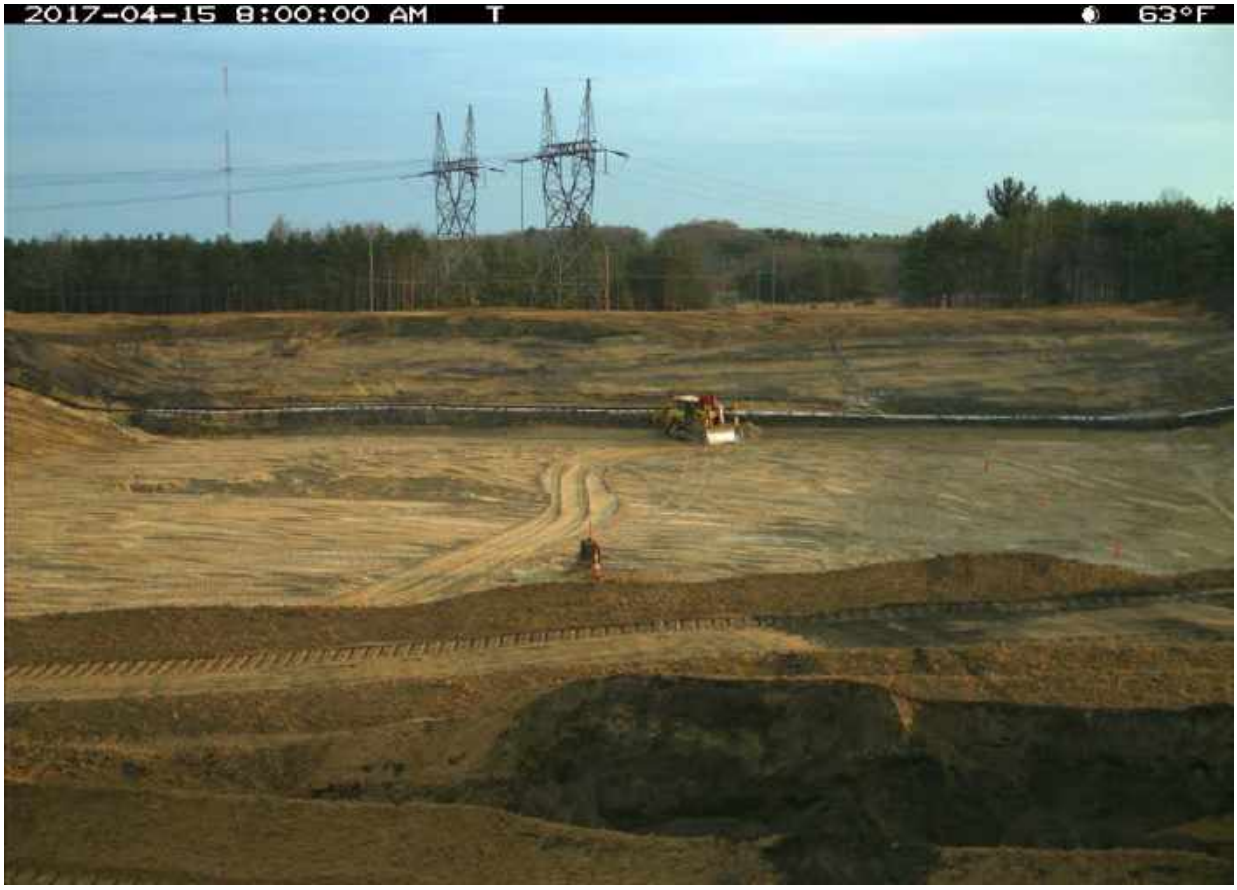
CEC J.H. Campbell Pond 3 North Excavation Sequence Photo Log

Orientation: Looking north.

CEC J.H. Campbell Pond 3 North Excavation Sequence Photo Log



Orientation: Looking north.

CEC J.H. Campbell Pond 3 North Excavation Sequence Photo Log

Orientation: Looking north.

CEC J.H. Campbell Pond 3 North Excavation Sequence Photo Log

Orientation: Looking north.

CEC J.H. Campbell Pond 3 North Excavation Sequence Photo Log

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CEC J.H. Campbell Pond 3 North Excavation Sequence Photo Log

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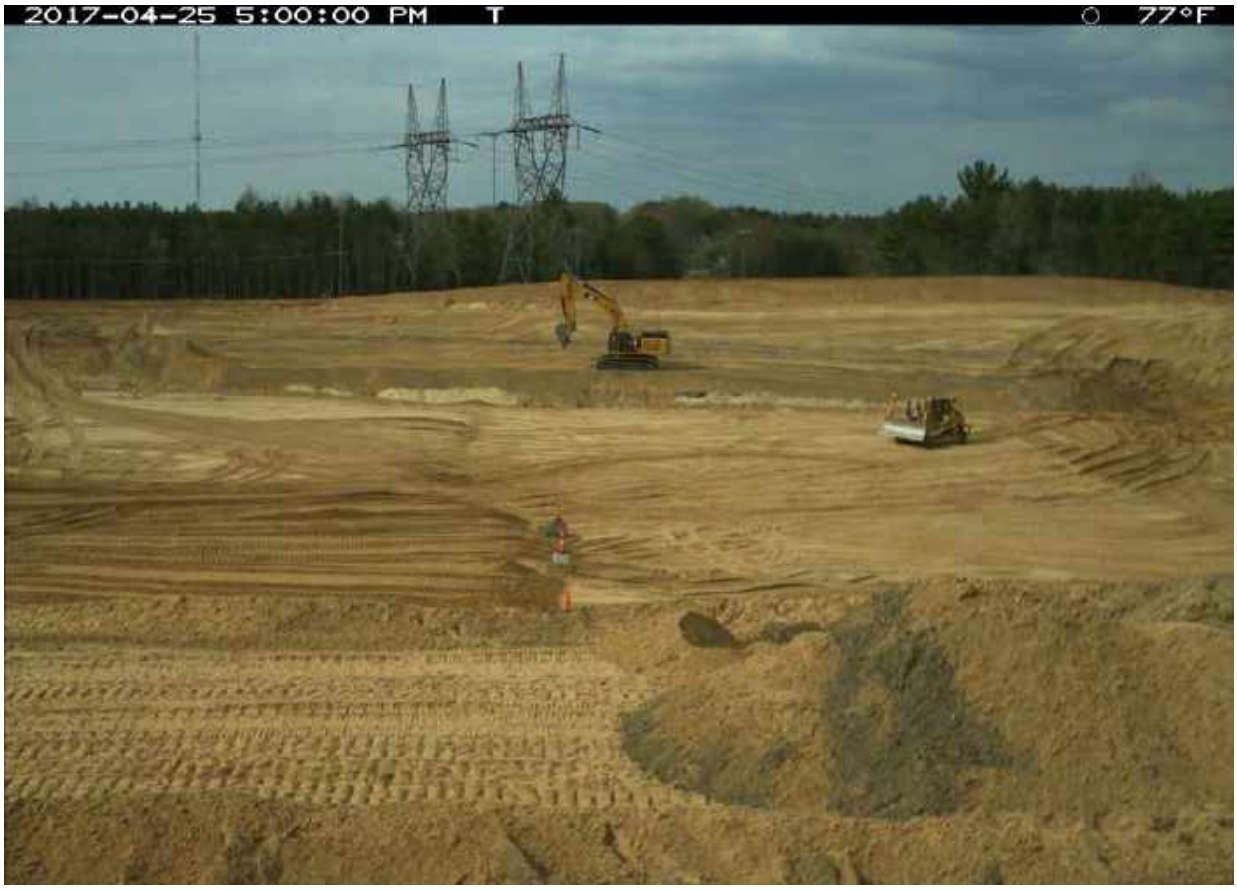
Orientation: Looking north.

CEC J.H. Campbell Pond 3 North Excavation Sequence Photo Log



Orientation: Looking north.

CEC J.H. Campbell Pond 3 North Excavation Sequence Photo Log

Orientation: Looking north.

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CEC J.H. Campbell Pond 3 North Excavation Sequence Photo Log

Orientation: Looking north.

CEC J.H. Campbell Pond 3 North Excavation Sequence Photo Log

Orientation: Looking north.

CEC J.H. Campbell Pond 3 North Excavation Sequence Photo Log

Image captured by drone (5/3/2017).

APPENDIX B
GRID NODE PHOTOGRAPHIC DOCUMENTATION LOG

CEC J.H. Campbell Pond 3 North CCR Removal Photo Documentation

Photo 1 of 51
Node Number: 19
Location: North 450, East 2100
Colorimeter Result: 2.36 percent CCR

CEC J.H. Campbell Pond 3 North CCR Removal Photo Documentation

Photo 2 of 51
Node Number: 21
Location: North 550, East 2100
Colorimeter Result: 0.0 percent CCR

CEC J.H. Campbell Pond 3 North CCR Removal Photo Documentation

Photo 3 of 51
Node Number: 22
Location: North 600, East 2100
Colorimeter Result: N/A

CEC J.H. Campbell Pond 3 North CCR Removal Photo Documentation

Photo 4 of 51
Node Number: 27
Location: North 850, East 2100
Colorimeter Result: 2.70 percent CCR
Note: Dark brown sand, trace black silt

CEC J.H. Campbell Pond 3 North CCR Removal Photo Documentation

Photo 5 of 51
Node Number: 36
Location: North 400, East 2150
Colorimeter Result: 1.53 percent CCR

CEC J.H. Campbell Pond 3 North CCR Removal Photo Documentation

Photo 6 of 51
Node Number: 37
Location: North 450, East 2150
Colorimeter Result: N/A

CEC J.H. Campbell Pond 3 North CCR Removal Photo Documentation

Photo 7 of 51
Node Number: 40
Location: North 600, East 2150
Colorimeter Result: N/A

CEC J.H. Campbell Pond 3 North CCR Removal Photo Documentation

Photo 8 of 51
Node Number: 41
Location: North 650, East 2150
Colorimeter Result: N/A

CEC J.H. Campbell Pond 3 North CCR Removal Photo Documentation

Photo 9 of 51
Node Number: 42
Location: North 700, East 2150
Colorimeter Result: 2.8 percent CCR

CEC J.H. Campbell Pond 3 North CCR Removal Photo Documentation

Photo 10 of 51
Node Number: 44
Location: North 800, East 2150
Colorimeter Result: 3.14 percent CCR

CEC J.H. Campbell Pond 3 North CCR Removal Photo Documentation

Photo 11 of 51
Node Number: 45
Location: North 850, East 2150
Colorimeter Result: NA
Notes: Dark brown to gray sand with clay, trace organics similar to material observed in Test Pits 3077 and 3078 (See Table 4).
*Surveying rod used for scale.

CEC J.H. Campbell Pond 3 North CCR Removal Photo Documentation

Photo 12 of 51
Node Number: 55
Location: North 450, East 2200
Colorimeter Result: N/A

CEC J.H. Campbell Pond 3 North CCR Removal Photo Documentation

Photo 13 of 51
Node Number: 59
Location: North 650, East 2200
Colorimeter Result: 3.96 percent CCR

CEC J.H. Campbell Pond 3 North CCR Removal Photo Documentation

Photo 14 of 51
Node Number: 61
Location: North 750, East 2200
Colorimeter Result: 1.71 percent CCR

CEC J.H. Campbell Pond 3 North CCR Removal Photo Documentation

Photo 15 of 51
Node Number: 62
Location: North 800, East 2200
Colorimeter Result: 0.0 percent CCR

CEC J.H. Campbell Pond 3 North CCR Removal Photo Documentation

Photo 16 of 51
Node Number: 63
Location: North 850, East 2200
Colorimeter Result: 0.99 percent CCR

CEC J.H. Campbell Pond 3 North CCR Removal Photo Documentation

Photo 17 of 51
Node Number: 73
Location: North 450, East 2250
Colorimeter Result: N/A

CEC J.H. Campbell Pond 3 North CCR Removal Photo Documentation

Photo 18 of 51
Node Number: 74
Location: North 500, East 2250
Colorimeter Result: N/A
Notes: Dark brown sand, trace black silt similar to material found in Test Pit 3076 (See Table 4)

CEC J.H. Campbell Pond 3 North CCR Removal Photo Documentation

Photo 19 of 51
Node Number: 75
Location: North 550, East 2250
Colorimeter Result: 4.74 percent CCR

CEC J.H. Campbell Pond 3 North CCR Removal Photo Documentation

Photo 20 of 51
Node Number: 79
Location: North 750, East 2250
Colorimeter Result: N/A

CEC J.H. Campbell Pond 3 North CCR Removal Photo Documentation

Photo 21 of 51
Node Number: 81
Location: North 850, East 2250
Colorimeter Result: N/A

CEC J.H. Campbell Pond 3 North CCR Removal Photo Documentation

Photo 22 of 51
Node Number: 90
Location: North 400, East 2300
Colorimeter Result: N/A

CEC J.H. Campbell Pond 3 North CCR Removal Photo Documentation

Photo 23 of 51
Node Number: 91
Location: North 450, East 2300
Colorimeter Result: N/A

CEC J.H. Campbell Pond 3 North CCR Removal Photo Documentation

Photo 24 of 51
Node Number: 92
Location: North 500, East 2300
Colorimeter Result: N/A
Notes: Dark brown sand, trace black silt similar to material identified in Test Pit 3076 (See Table 4).

CEC J.H. Campbell Pond 3 North CCR Removal Photo Documentation

Photo 25 of 51
Node Number: 93
Location: North 550, East 2300
Colorimeter Result: N/A

CEC J.H. Campbell Pond 3 North CCR Removal Photo Documentation

Photo 26 of 51
Node Number: 98
Location: North 800, East 2300
Colorimeter Result: 0.64 percent CCR

CEC J.H. Campbell Pond 3 North CCR Removal Photo Documentation

Photo 27 of 51
Node Number: 108
Location: North 400, East 2350
Colorimeter Result: N/A
Notes: Dark brown sand with traces of black silty sand

CEC J.H. Campbell Pond 3 North CCR Removal Photo Documentation

Photo 28 of 51
Node Number: 110
Location: North 500, East 2350
Colorimeter Result: 3.89 percent CCR
Notes: Dark brown sand, trace black silt similar to material found in Test Pit 3076 (See Table 4)

CEC J.H. Campbell Pond 3 North CCR Removal Photo Documentation

Photo 29 of 51
Node Number: 111
Location: North 550, East 2350
Colorimeter Result: 1.31 percent CCR

CEC J.H. Campbell Pond 3 North CCR Removal Photo Documentation

Photo 30 of 51
Node Number: 114
Location: North 700, East 2350
Colorimeter Result: 0.73 percent CCR

CEC J.H. Campbell Pond 3 North CCR Removal Photo Documentation

Photo 31 of 51
Node Number: 116
Location: North 800, East 2350
Colorimeter Result: 1.55 percent CCR
Notes: Dark brown to black sand, trace organics.

CEC J.H. Campbell Pond 3 North CCR Removal Photo Documentation

Photo 32 of 51
Node Number: 117
Location: North 850, East 2350
Colorimeter Result: 1.30 percent CCR

CEC J.H. Campbell Pond 3 North CCR Removal Photo Documentation

Photo 33 of 51
Node Number: 126
Location: North 400, East 2400
Colorimeter Result: N/A
*****Note:** The Node number in the photo is reported inncorrectly. This photo is of Node number 126.

CEC J.H. Campbell Pond 3 North CCR Removal Photo Documentation

Photo 34 of 51
Node Number: 132
Location: North 700, East 2400
Colorimeter Result: N/A

CEC J.H. Campbell Pond 3 North CCR Removal Photo Documentation

Photo 35 of 51
Node Number: 133
Location: North 750, East 2400
Colorimeter Result: 0.16 percent CCR

CEC J.H. Campbell Pond 3 North CCR Removal Photo Documentation

Photo 36 of 51
Node Number: 134
Location: North 800, East 2400
Colorimeter Result: 0.35 percent CCR

CEC J.H. Campbell Pond 3 North CCR Removal Photo Documentation

Photo 37 of 51
Node Number: 144
Location: North 450, East 2450
Colorimeter Result: N/A

CEC J.H. Campbell Pond 3 North CCR Removal Photo Documentation

Photo 38 of 51
Node Number: 145
Location: North 500, East 2450
Colorimeter Result: 1.78 percent CCR
Notes: Dark brown sand with traces of black silty sand

CEC J.H. Campbell Pond 3 North CCR Removal Photo Documentation

Photo 39 of 51
Node Number: 146
Location: North 550, East 2450
Colorimeter Result: 0.0 percent CCR

CEC J.H. Campbell Pond 3 North CCR Removal Photo Documentation

Photo 40 of 51
Node Number: 148
Location: North 650, East 2450
Colorimeter Result: 2.79 percent CCR

CEC J.H. Campbell Pond 3 North CCR Removal Photo Documentation

Photo 41 of 51
Node Number: 149
Location: North 700, East 2450
Colorimeter Result: 1.38 percent CCR

CEC J.H. Campbell Pond 3 North CCR Removal Photo Documentation

Photo 42 of 51
Node Number: 159
Location: North 400, East 2500
Colorimeter Result: N/A
Notes: Dark brown sand, trace black silty sand

CEC J.H. Campbell Pond 3 North CCR Removal Photo Documentation

Photo 43 of 51
Node Number: 160
Location: North 450, East 2500
Colorimeter Result: 2.16 percent CCR
Notes: Dark brown sand with traces of black silty sand

CEC J.H. Campbell Pond 3 North CCR Removal Photo Documentation

Photo 44 of 51
Node Number: 162
Location: North 550, East 2500
Colorimeter Result: 1.21 percent CCR
Notes: Dark brown sand with traces of black silty sand, trace organics

CEC J.H. Campbell Pond 3 North CCR Removal Photo Documentation

Photo 45 of 51
Node Number: 163
Location: North 600, East 2500
Colorimeter Result: N/A

CEC J.H. Campbell Pond 3 North CCR Removal Photo Documentation

Photo 46 of 51
Node Number: 164
Location: North 650, East 2500
Colorimeter Result: N/A
Notes: Dark brown sand with traces of black silty sand

CEC J.H. Campbell Pond 3 North CCR Removal Photo Documentation

Photo 47 of 51
Node Number: 169
Location: North 650, East 2550
Colorimeter Result: 1.88 percent CCR
Notes: Dark brown sand with traces of black silty sand

CEC J.H. Campbell Pond 3 North CCR Removal Photo Documentation

Photo 48 of 51
Node Number: 171
Location: North 750, East 2550
Colorimeter Result: N/A

CEC J.H. Campbell Pond 3 North CCR Removal Photo Documentation

Photo 49 of 51
Node Number: 172
Location: North 800, East 2550
Colorimeter Result: 0.70 percent CCR

CEC J.H. Campbell Pond 3 North CCR Removal Photo Documentation

Photo 50 of 51
Node Number: 173
Location: North 850, East 2550
Colorimeter Result: 1.78 percent CCR

CEC J.H. Campbell Pond 3 North CCR Removal Photo Documentation

Photo 51 of 51
Node Number: 173
Location: North 850, East 2550
Colorimeter Result: 1.78 percent CCR

APPENDIX C
POND 3 NORTH ALTERNATIVE COAL COMBUSTIONS RESIDUALS REMOVAL DOCUMENTATION LETTER, DATED MAY 25, 2017

May 25, 2017

Tim Unseld
District Engineer
Michigan Department of Environmental Quality - OWMRP
Grand Rapids District Office
350 Ottawa Avenue, NW Unit 10
Grand Rapids, Michigan, 49503

Subject: Pond 3 North Alternative Coal Combustions Residuals Removal Documentation
JH Campbell, Unit 3 North/South Bottom Ash Ponds
West Olive, Michigan

Dear Mr. Unseld,

This letter is to document Consumers Energy Company's (CEC) alternative method for verifying removal of coal combustion residuals (CCR) from a portion of Pond 3 North as part of ongoing pond closure work. CEC submitted the *JH Campbell Generating Facility Bottom Ash Ponds 3 N/S Closure Work Plan* (Work Plan) to the Michigan Department of Environmental Quality (MDEQ) on January 27, 2017. The Work Plan detailed CEC's plan to remove coal combustion residuals (CCRs) from the Unit 3 North and South Bottom Ash Ponds (Bottom Ash Ponds 3 N/S) at its JH Campbell Generating Facility located in West Olive, Michigan. During excavation along the berm between Bottom Ash Ponds 3N and 3S, a thin dark brown fill was encountered, which was not consistent with the materials anticipated by CEC's approved Work Plan.

To achieve CCR waste removal and subsequently CEC's plan to close Ponds 3N/S by removal of CCR in accordance with self-implementing requirements of the CCR Resource Conservation and Recovery act (RCRA) Rule (40 CFR 257 Subpart D) ("CCR RCRA Rule"), CEC described an approach to document CCR removal based on a multiple lines of evidence approach that includes excavation and photographic documentation as well as quantitative colorimetric analysis. This approach takes advantage of the clear visible demarcation between CCR and the underlying soil observed during previous removal activities and in soil borings. MDEQ concurred with the Work Plan in a letter dated February 23, 2017. As described above, during excavation along the berm between Bottom Ash Pond 3N and 3S, a thin layer of dark brown fill was encountered. The sand and mineral materials in the miscellaneous fill layer were not consistent with the light brown sand used in the creation of the standard colorimetric curve. For this reason Golder Associates Inc. (Golder) and their petrographic subconsultant Wiss, Janney, Estner Associates Inc. (WJE) conducted additional exploration and analysis of the material at locations representing the extent of fill that was encountered. Those analyses, detailed in the attached memorandums from Golder and WJE, document the material does not contain >5% CCR and therefore does not require excavation. Golder's memorandum details the multiple lines of evidence approach used to document the material did not contain >5% CCR in conformance with the Work Plan. This includes the use of stereomicroscopy, which was discussed as a valid means of measuring CCR in the Work Plan, to

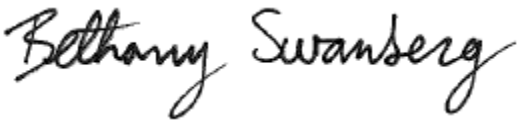
replace the colorimetric analysis. Furthermore, WJE prepared a memorandum detailing their method of determining CCR concentrations via laboratory microscopy, which includes photographic evidence that CCR particles are clearly distinguished by their shape, color, and glassy appearance.

Based on the above analyses, the material was left in place as it contained <5% CCRs. Additionally, even though the fill did not appear to be native, it was left in place as there was concern that removal of the material could disturb the stability of the south berm, which was controlling water from Bottom Ash Pond 3S. The multiple lines of evidence approach detailing the closure process and confirmation of removal of CCRs detailed in the approved Work Plan and this correspondence will be submitted to the MDEQ in the pond closure documentation report.

Please contact Brad Runkel at (517) 788 – 2980 with any questions.

Sincerely,

Consumers Energy



Bethany Swanberg, EIT
Environmental Services

Attachment 1 – Memorandum

Subject: JH Campbell Bottom Ash Pond 3N South Limits of Excavation, R3

Author: Golder Associates

Date: May 4, 2017

MEMORANDUM

Date:	May 25, 2017	**Project No.:**	1777605
To:	Aaron Davis, Tim Broilo, Nicole Kramer	**Company:**	Consumers Energy Company
From:	Mark Bergeon		
cc:	Andrew Baird, Ben Schmidt, Laura Powers, Halle Doering, Matt Wachholz		

RE: J.H. CAMPBELL BOTTOM ASH POND 3N SOUTH LIMITS OF EXCAVATION, R3

Golder Associates Inc. (Golder) and our petrographic subconsultant, Wiss, Janney, Estner Associates, Inc. (WJE), have conducted additional exploration of the center berm of Bottom Ash Pond 3. Four tests pits were excavated by Ryan Central on April 25, 2017; and soil samples were collected to evaluate if coal combustion residuals (CCR) were present. The test pits were completed to assess and compare the current subsurface conditions to borings Pond 3B-4 and SB-1503. A layer of apparent CCR identified in these borings was used to establish the final elevation of CCR removal at 615 feet above mean sea level (msl) in this area of the excavation.

During excavation along the center berm of Bottom Ash Pond 3, a thin layer of what appeared to be miscellaneous fill consisting of dark brown to gray silty sand, silt, and clay with some black organics was encountered. The material encountered did not have the appearance or characteristics of the CCR being removed from the surrounding areas. Therefore, field personnel questioned whether the material needed to be removed. The field personnel also noted that removal of this layer to the south would require the removal of a large volume of clean sand above it and that the sand would have to be replaced to maintain the integrity of Bottom Ash Pond 3S.

A review of the design plans and the boring logs indicated that the material encountered was likely the same material encountered at approximate elevations of 618 to 620 feet above msl in previously advanced borings Pond 3B-4 and SB-1503 (boring logs attached and approximate test pit and boring locations are shown on the attached Test Pit Location Diagram). The material in boring Pond 3B was described as “dark brown to gray sandy ASH, trace cinders” and was underlain by sand that included “trace gravel and organics.”

Test pits were dug into the face of the south berm to facilitate collection of samples to evaluate whether CCR were present in the apparent fill material. The test pits were advanced in locations that would provide reasonable access for sampling and photography. The south berm slopes from the approximate elevation of 617 feet above msl, where the apparent layer of miscellaneous fill was encountered to a top of berm elevation of approximately 630 feet above msl. Consequently, test pits further up the slope would have been dug to depths making them inaccessible for photography and would have limited sampling to

backhoe bucket samples. The selected locations provided access to the layer for hand sampling and photography.

Test pit logs were prepared to document field conditions, provide the horizontal and vertical locations of the test pits and samples collected, and document descriptions of the materials encountered in the test pits. Photographs were taken of the test pits and sampled material. The test pit logs and photographs are attached. Field sample descriptions are also included in Table 1. Based on the description of the material encountered in the field, what was described in boring Pond 3B as gray sandy ASH may have been the dark brown/gray sand with clay observed in test pit 3078.

The collected samples were split, dried, and observed under a microscope. The percent CCR in each sample was estimated based on the microscopic analysis and compared to a premixed standard. Quantitative colorimeter analyses were not practicable for these samples due to the dark organics and other material present in the samples. The sample descriptions and percent CCR for each sample are included on the following table:

Table 1 - Test Pit Summary

Test Pit No.	Northing	Easting	Top Elevation	Bottom Elevation	Layer/Sample Elevation	Field Sample Description	% CCR by Microscopy	
							Field	Lab
3075	461.288	2216.483	621	613	N/A	Brown sand, trace clay	2 - 3	2.6
3076	468.194	2171.272	625	613	615	Dark brown sand with silt, trace CCR	2 - 3	2.9
3077	473.928	2395.799	623	612	618	Dark brown silty sand, trace gravel, trace organics, 4-inch fragment of dark gray to black asphaltic cement, trace CCR	3 - 5	3.8
3078	467.148	2462.118	626	614	616	Dark brown/gray sand with clay, trace organics	1 - 2	2.3

Notes: Location information relative to JH Campbell plant coordinate system

Samples from each test pit were submitted to WJE's laboratory in Northbrook, Illinois for additional laboratory analysis. In the laboratory, CCR content was determined using a stereomicroscope. Laboratory results are documented in the May 3, 2017 memorandum from WJE to Golder (attached). The laboratory results confirm the CCR content of less than five percent in the four samples analyzed.

The test data indicate that the subject materials encountered in the test pits contain less than five percent CCR and; therefore, do not require removal in accordance with the approved closure plan. Assuming no additional field indications of CCR are observed that would require further excavation, the center section of the interior slope of the south berm can be cut to match the other excavation slopes. Because

excavation will not continue to the south, we do not anticipate a need for temporary steel sheeting along the southern edge of the excavation.

The following three lines of evidence will be provided in the closure documentation report for submittal to the Michigan Department of Environmental Quality (MDEQ):

- Test pits extended to grades of anticipated elevations of CCR from previous site characterizations (final excavation grades compared to known elevations of CCR from previous site characterizations in the work plan)
- Test pits and sampled material documented with photographs (photographic documentation of excavated areas in the work plan)
- Microscopic estimates of the percent CCR present (quantitative colorimetric analysis in the work plan)

Removal of CCR from the remainder of the south slope will be documented as presented in Bottom Ash Pond 3 N/S Closure Work Plan (Rev. 1), which was submitted to the MDEQ on January 27, 2017.

Attachments: Pond 3B-4 Boring Log
SB-1503 Boring Log
Test Pit Location Diagram
Test Pit Logs
Test Pit Photo Log
WJE Pond 3N Test Pit Material Memorandum, May 2017

Engineering & Environmental Solutions, LLC

400 136th Avenue
Building 100, Suite B
Holland, Michigan 49424
Phone/Fax: (616) 994-6541
www.goEESolutions.com

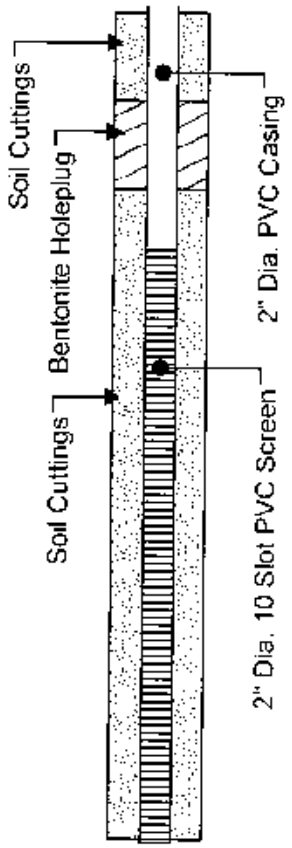
Project Name: Consumers Unit 3 Pond Berm
Project Number: 005-16-012
Site Location: JH Campbell
Drilling Method: 8.25" OD HSA
Sampling Method: 2' Split Spoon
Ground Elevation (feet): 632.81
Top of Casing Elevation (feet): 634.72
Logged By: Kurt Van Appledorn
Comments: 1.9' Stickup with J-plug cap

Log of Borehole: Pond 3B-4

Start Date: 9-14-2016
End Date: 9-14-2016
Driller: Mateco
Crew Chief: Gary
Depth to Water (ft BGS during drilling): 19
Easting: 12633865.97
Northing: 519671.53

Depth (feet BGS)	Symbol	Description	Elevation (feet above msl)	Sample Length (feet)	Recovery (feet)	Blow Counts
		SUBSURFACE PROFILE		**SAMPLE**		
0		Ground Surface	632.8			
1		0-0.8' Black sandy ASH, some coarse cinders	632.0	2	1.0	5 8 8 8
2		0.8-13.0' Brown fine SAND				
3						
4		Dark brown fine sand ash at 3-3.5'		2	1.7	6 5 7 10
5						
6						
7		Dark brown find sandy ash with trace black cinders at 8.2-9.0'				
8						
9				2	2.0	5 7 18 19
10						
11						
12						
13			619.8			
14		13.0-13.5' Dark brown to gray sandy ASH, trace cinders		2	2.0	8 17 22 22
15		13.5-18.6' Dark brown silty fine SAND (natural), trace gravel and organics, some 1" brown fine sand layers.				
16						
17						
18			614.2			
19		18.6-28.0' Brown fine SAND Wet at 19'		2	2.0	8 12 17 20
20						
21						
22		3-4" seams of brown silty sand between 23 and 25'				
23						
24				2	2.0	6 8 11 17
25						
26		silty sand below 26' with 1" wood at 27'				
27				2	1.9	3 6 11 16
28			604.8			
29		End of Boring				
30						
31						
32						
33						
34						
35						
36						
37						
38						
39						

Well Completion Details



RECORD OF BOREHOLE SB-1503

SHEET 1 of 1

PROJECT: Campbell Bottom Ash Tanks
PROJECT NUMBER: 1524652A
LOCATION: West Olive, MI

DRILLING METHOD: 8.25" O.D. HSA
DRILLING DATE: 02-26-15
DRILL RIG:

DATUM:
COORDINATES: N: 519,669.30 E: 12,633,974.91

ELEVATION: 632.89
INCLINATION: -90

DEPTH (Ft)	BORING METHOD	DESCRIPTION	USCS	GRAPHIC LOG	ELEV. / DEPTH (Ft)	NUMBER	TYPE	BLOWS per 6 in (300 lb hammer 30 inch drop)	N	REC / ATT	NOTES WATER LEVELS
0	8.25" O.D. HSA	0.0 - 4.7 Black silty fine SAND, little black fine gravel, dry to moist [ASH FILL]	SP		628.2						
5		4.7 - 12.0 Brown fine SAND, moist [FILL]	SP		4.7	1	SS	2-3-7-11	10	17.0 / 2.0	
10		Wet at 9'			620.9	2	SS	5-11-16-20	27	17.0 / 2.0	
15		12.0 - 31.0 Greyish brown silty SAND, wet [FILL-TRACE ASH] Black cinder at 14.2'			12.0	3	SS	6-12-18-21	30	17.0 / 2.0	Backfilled with Bentonite Grout Topped Off Upper 6 Feet with Bentonite Holeplug
20			SP			4	SS	2-8-10-10	18	17.0 / 2.0	
25		Wood piece at 24'				5	SS	2-3-8-11	11	12.0 / 2.0	
30		30.1 - 31.0 Brown fine SAND, wet [NATIVE]	SP		601.9	6	SS	3-4-9-15	13	20.0 / 2.0	
35		Boring completed at 31.0 ft.			31.0						
40											

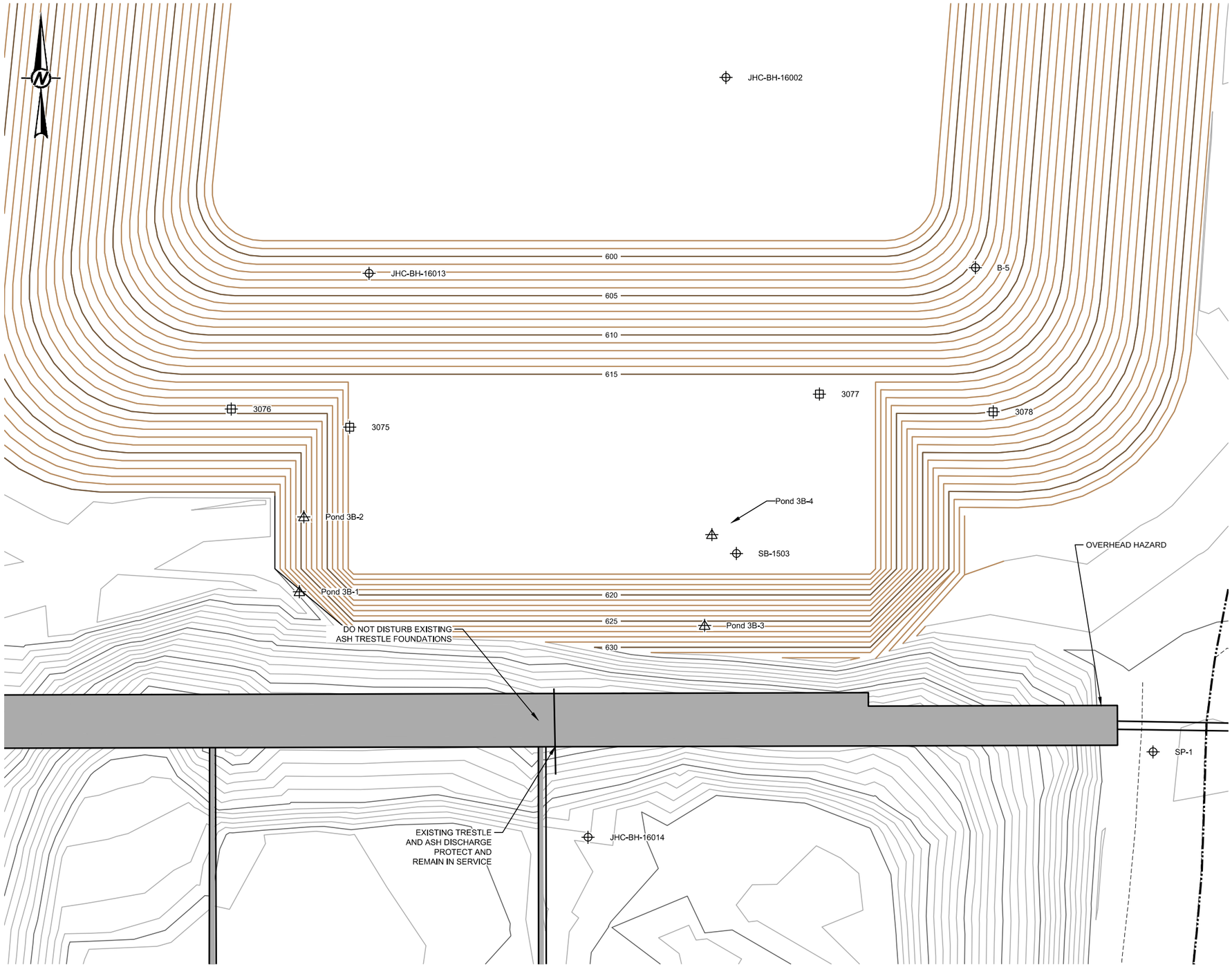
PENETRATION RESISTANCE BLOWS / ft ◆
10 20 30 40
PL MC LL
20 40 60 80

1 in to 5 ft
DRILLING CONTRACTOR: Stearns Drilling
DRILLER: Jerry

LOGGED: KVA (E&ES)
CHECKED: MRF
DATE: 3/27/2015

Golder Associates

RECORD OF BOREHOLE CEC CAMPBELL BOTTOM ASH TANK LOGS.GPJ SPARKLE_1.0_DATA_TEMPLATE.GDT 11/9/15



LEGEND

- 624 — EXISTING GROUND TOPOGRAPHY
- 624 — ESTIMATED CCR REMOVAL GRADE
- EXISTING EDGE OF GRAVEL ROAD
- EXISTING OVERHEAD LINES
- SOLID WASTE BOUNDARY (REFERENCE 3)
- EXISTING TOWER STRUCTURE
- EXISTING MONITORING WELL LOCATIONS
- EXISTING BOREHOLE LOCATIONS
- EXISTING PIEZOMETER LOCATIONS
- EXISTING TESTPIT LOCATIONS

NOTE(S)

1. CONTRACTOR TO REMOVE CCR FROM POND 3N AND DISPOSE IN ONSITE DRY ASH LANDFILL IN ACCORDANCE WITH THE SPECIFICATIONS.
2. REFER TO GEOTECHNICAL REPORT FOR EXISTING GROUNDWATER CONDITIONS.

REFERENCES

1. EXISTING TOPOGRAPHY CONSISTS OF COMPILED SURFACES PROVIDED BY CEC, FROM DRAWING "CAMPBASE.DWG", AND FROM SURVEYS PERFORMED BY ENGINEERING AND ENVIRONMENTAL SOLUTIONS, LLC. IN FEBRUARY 2015 AND MAY AND JULY 2016.
2. BACKGROUND IMAGE: JULY 20, 2016, USDA-FSA-APFO DIGITAL ORTHO MOSAIC.
3. SOLID WASTE BOUNDARY LINE COPIED FROM LAYER "AREAS" IN DRAWING "SP 094-15-001-survey.dwg" PROVIDED MARCH 16, 2015, BY ENGINEERING & ENVIRONMENTAL SOLUTIONS, LLC.

FOR DISCUSSION PURPOSES

DRAFT

0 20 40

1" = 20' FEET

TEST PIT LOCATION DIAGRAM

Golder Associates

FIGURE 000

Golder Associates

Field Test Pit Log

DEPTH HOLE 8 feet **PROJ. NO.** 177605 **PROJECT** BA Pond 3N **BORING NO.** 3075

DEPTH SOIL DRILL --- **GA INSP.** APW **DRILLING METHOD** Backhoe - Test Pit **SHEET** 1 **OF** 1

DEPTH ROCK CORE --- **WEATHER** 70 Sunny **DRILLING COMPANY** Ryan Central **SURFACE ELEV.** 621 to 613

ABANDONMENT Backfill, compacted **DRILL RIG** ----- **DRILLER** ---- **DATUM** Site Datum

DEPTHS --- / --- / ---- / --- (WATER LEVEL / CAVE-IN / DATE-TIME / NOTE) **SAMPLER HAMMER TYPE** ---- **WT.** ---- **DROP** ---- **STARTED** 1520 (TIME) / 4/25/17 (DATE)

DEPTHS (DELAYED) --- / --- / --- / --- (WATER LEVEL / CAVE-IN / DATE-TIME / NOTE) **HOLE LOCATION** Northing 461, Easting 2216 **COMPLETED** 1530 (TIME) / 4/25/17 (DATE)

SAMPLE TYPES

	A.S.	AUGER SAMPLE
	C.S.	CHUNK SAMPLE
*	D.O.	DRIVE OPEN (SPT)
	D.S.	DENISON SAMPLE
	F.S.	FOIL SAMPLE
	P.S.	PITCHER SAMPLE
	S.C.	SOIL CORE
*	T.O.	THIN-WALLED, OPEN
*	T.P.	THIN-WALLED, PISTON
	W.S.	WASH SAMPLE
*	___	_____
*	___	_____
*	___	_____

* NOTE SIZE

ABBREVIATIONS

ANG	ANGULAR	GR	GRAY	R	RED
BL	BLACK	HE	HETEROGENEOUS	RES	RESIDUAL
BR	BROWN	HO	HOMOGENEOUS	RX	ROCK
C	COARSE	LYD	LAYERED	RND	ROUNDED
CIN	CAVE-IN	M	MEDIUM	SAT	SATURATED
CO	COHESIVE	MIC	MICACEOUS	SD	SAND
CL	CLAY	MOT	MOTTLED	SI	SILT
CLY	CLAYEY	MST	MOIST	SIY	SILTY
D	DRY	NC	NON-COHESIVE	SM	SOME
EL	ELONGATED	NP	NON-PLASTIC	TR	TRACE
F	FINE	OG	ORANGE	WL	WATER LEVEL
FL	FLAT	ORG	ORGANIC	WH	WEIGHT OF HAMMER
FRAG	FRAGMENTS	PP	POCKET PEN.	WR	WEIGHT OF RODS
GL	GRAVEL	PL	PLASTIC LIMIT	Y	YELLOW

ORDER OF DESCRIPTION

1) GROUP SYMBOL
2) SOIL GROUP NAME
3) PRIMARY COMPONENTS
4) SECONDARY COMPONENTS
5) MINOR COMPONENTS ;
6) COLOR
7) WEATHERING
8) STRUCTURE
9) SENSITIVITY
10) CONTAMINATION
11) MINEROLOGY
12) ORIGIN ;
13) BEHAVIOR (CO/NC)
14) MOISTURE/WATER CONTENT
15) DENSITY/CONSISTENCY

PLUS DESCRIPTION:
CL/SI: PLASTICITY
SD: SIZE, GRADING
GL: SIZE, GRADING, SHAPE, ROCK TYPE

PROPORTIONS

"TRACE"	0 – 5%
"SOME"	5 – 12%
PREFIX "-Y"	12 – 35%
"AND"	35 – 50%

NON-COHESIVE SOILS

RELATIVE DENSITY		BLOWS
VERY LOOSE	VLS	0 – 4
LOOSE	LS	4 – 10
COMPACT	CP	10 – 30
DENSE	DN	30 – 50
VERY DENSE	VDN	>50

MOISTURE CONDITION

DRY	SOIL FLOWS
MOIST	FEELS COOL
WET	WITH FREE WATER

COHESIVE SOILS

CONSISTENCY		PP(TSF)	FINGER PRESSURE
VERY SOFT	VS	<0.25	EXTRUDES
SOFT	S	0.25 - 0.5	MOLDS EASILY
FIRM	FM	0.5 – 1	MOLDS
STIFF	ST	1 – 2	THUMB INDENTS
VERY STIFF	VST	2 – 4	THUMBNAIL INDENTS
HARD	H	>4	RESISTS THUMBNAIL

WATER CONTENT - W

W < PL	CANNOT ROLL 4 mm THREAD
W ~ PL	CAN ROLL THREAD 2 – 4 mm
W > PL	CAN ROLL THREAD <2 mm

ELEV. / DEPTH	LITHOLOGY	SPT N / PP (TSF)	SAMPLES NO.	SAMPLES TYPE	SAMPLES HAMMER BLOWS PER 6 IN	SAMPLES REC / ATT	DEPTH	SAMPLE DESCRIPTION AND DRILLING NOTES
621	0.0 - 8.0 BR fine SAND, moist Trace CCR							
0								
620								
1								
619								
2								
618								
3								
617								
4								
616								
5								
615	Dark brown sand, trace CLAY lenses		5705	Bag		6		Bag sample from darkest lenses found, some organics, dark brown silt, some clay.
6								
614								
7								
613								
8								

Golder Associates

Golder Associates

Field Test Pit Log

DEPTH HOLE 12 feet **PROJ. NO.** 177605 **PROJECT** BA Pond 3N **BORING NO.** 3076

DEPTH SOIL DRILL --- **GA INSP.** APW **DRILLING METHOD** Backhoe - Test Pit **SHEET** 1 **OF** 1

DEPTH ROCK CORE --- **WEATHER** 70 Sunny **DRILLING COMPANY** Ryan Central **SURFACE ELEV.** 625 to 613

ABANDONMENT Backfill, compacted **DRILL RIG** ----- **DRILLER** ---- **DATUM** Site Datum

DEPTHS --- / --- / ---- / --- (WATER LEVEL / CAVE-IN / DATE-TIME / NOTE) **SAMPLER HAMMER TYPE** ---- **WT.** ---- **DROP** ---- **STARTED** 1510 / 4/25/17 (TIME / DATE)

DEPTHS (DELAYED) --- / --- / --- / --- (WATER LEVEL / CAVE-IN / DATE-TIME / NOTE) **HOLE LOCATION** Northing 468, Easting 2171 **COMPLETED** 1520 / 4/25/17 (TIME / DATE)

SAMPLE TYPES

	A.S.	AUGER SAMPLE
	C.S.	CHUNK SAMPLE
*	D.O.	DRIVE OPEN (SPT)
	D.S.	DENISON SAMPLE
	F.S.	FOIL SAMPLE
	P.S.	PITCHER SAMPLE
	S.C.	SOIL CORE
*	T.O.	THIN-WALLED, OPEN
*	T.P.	THIN-WALLED, PISTON
	W.S.	WASH SAMPLE
*	___	_____
*	___	_____
*	___	_____

* NOTE SIZE

ABBREVIATIONS

ANG	ANGULAR	GR	GRAY	R	RED
BL	BLACK	HE	HETEROGENEOUS	RES	RESIDUAL
BR	BROWN	HO	HOMOGENEOUS	RX	ROCK
C	COARSE	LYD	LAYERED	RND	ROUNDED
CIN	CAVE-IN	M	MEDIUM	SAT	SATURATED
CO	COHESIVE	MIC	MICACEOUS	SD	SAND
CL	CLAY	MOT	MOTTLED	SI	SILT
CLY	CLAYEY	MST	MOIST	SIY	SILTY
D	DRY	NC	NON-COHESIVE	SM	SOME
EL	ELONGATED	NP	NON-PLASTIC	TR	TRACE
F	FINE	OG	ORANGE	WL	WATER LEVEL
FL	FLAT	ORG	ORGANIC	WH	WEIGHT OF HAMMER
FRAG	FRAGMENTS	PP	POCKET PEN.	WR	WEIGHT OF RODS
GL	GRAVEL	PL	PLASTIC LIMIT	Y	YELLOW

ORDER OF DESCRIPTION

1) GROUP SYMBOL
2) SOIL GROUP NAME
3) PRIMARY COMPONENTS
4) SECONDARY COMPONENTS
5) MINOR COMPONENTS ;
6) COLOR
7) WEATHERING
8) STRUCTURE
9) SENSITIVITY
10) CONTAMINATION
11) MINEROLOGY
12) ORIGIN ;
13) BEHAVIOR (CO/NC)
14) MOISTURE/WATER CONTENT
15) DENSITY/CONSISTENCY

PLUS DESCRIPTION:
CL/SI: PLASTICITY
SD: SIZE, GRADING
GL: SIZE, GRADING, SHAPE, ROCK TYPE

PROPORTIONS

"TRACE"	0 – 5%
"SOME"	5 – 12%
PREFIX "-Y"	12 – 35%
"AND"	35 – 50%

NON-COHESIVE SOILS

RELATIVE DENSITY		BLOWS
VERY LOOSE	VLS	0 – 4
LOOSE	LS	4 – 10
COMPACT	CP	10 – 30
DENSE	DN	30 – 50
VERY DENSE	VDN	>50

MOISTURE CONDITION

DRY	SOIL FLOWS
MOIST	FEELS COOL
WET	WITH FREE WATER

COHESIVE SOILS

CONSISTENCY		PP(TSF)	FINGER PRESSURE
VERY SOFT	VS	<0.25	EXTRUDES
SOFT	S	0.25 - 0.5	MOLDS EASILY
FIRM	FM	0.5 – 1	MOLDS
STIFF	ST	1 – 2	THUMB INDENTS
VERY STIFF	VST	2 – 4	THUMBNAIL INDENTS
HARD	H	>4	RESISTS THUMBNAIL

WATER CONTENT - W

W < PL	CANNOT ROLL 4 mm THREAD
W ~ PL	CAN ROLL THREAD 2 – 4 mm
W > PL	CAN ROLL THREAD <2 mm

ELEV. / DEPTH	LITHOLOGY	SPT N / PP (TSF)	SAMPLES NO.	SAMPLES TYPE	SAMPLES HAMMER BLOWS PER 6 IN	SAMPLES REC / ATT	DEPTH	SAMPLE DESCRIPTION AND DRILLING NOTES
625 0	0.0 - 11.0 BR fine SAND, moist Trace CCR							
624 1								
623 2								
621 3								
620 4								
619 5								
618 6								
617 7								
616 8								
615 9	Dark brown sand with silt, trace CCR		3076	Bag		9		Bag sample from dark lenses, some organics, dark brown silt.
614 10								
613 11								

Dec 2012

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Field Test Pit Log

DEPTH HOLE 11 feet **PROJ. NO.** 177605 **PROJECT** BA Pond 3N **BORING NO.** 3077

DEPTH SOIL DRILL --- **GA INSP.** APW **DRILLING METHOD** Backhoe - Test Pit **SHEET** 1 **OF** 1

DEPTH ROCK CORE --- **WEATHER** 70 Sunny **DRILLING COMPANY** Ryan Central **SURFACE ELEV.** 623 to 612

ABANDONMENT Backfill, compacted **DRILL RIG** ----- **DRILLER** ---- **DATUM** Site Datum

DEPTHS --- / --- / ---- / --- (WATER LEVEL / CAVE-IN / DATE-TIME / NOTE) **SAMPLER HAMMER TYPE** ---- **WT.** ---- **DROP** ---- **STARTED** 1540 / 4/25/17 (TIME / DATE)

DEPTHS (DELAYED) --- / --- / --- / --- (WATER LEVEL / CAVE-IN / DATE-TIME / NOTE) **HOLE LOCATION** Northing 473, Easting 2395 **COMPLETED** 1550 / 4/25/17 (TIME / DATE)

SAMPLE TYPES

	A.S.	AUGER SAMPLE
	C.S.	CHUNK SAMPLE
*	D.O.	DRIVE OPEN (SPT)
	D.S.	DENISON SAMPLE
	F.S.	FOIL SAMPLE
	P.S.	PITCHER SAMPLE
	S.C.	SOIL CORE
*	T.O.	THIN-WALLED, OPEN
*	T.P.	THIN-WALLED, PISTON
	W.S.	WASH SAMPLE
*	___	_____
*	___	_____
*	___	_____

* NOTE SIZE

ABBREVIATIONS

ANG	ANGULAR	GR	GRAY	R	RED
BL	BLACK	HE	HETEROGENEOUS	RES	RESIDUAL
BR	BROWN	HO	HOMOGENEOUS	RX	ROCK
C	COARSE	LYD	LAYERED	RND	ROUNDED
CIN	CAVE-IN	M	MEDIUM	SAT	SATURATED
CO	COHESIVE	MIC	MICACEOUS	SD	SAND
CL	CLAY	MOT	MOTTLED	SI	SILT
CLY	CLAYEY	MST	MOIST	SIY	SILTY
D	DRY	NC	NON-COHESIVE	SM	SOME
EL	ELONGATED	NP	NON-PLASTIC	TR	TRACE
F	FINE	OG	ORANGE	WL	WATER LEVEL
FL	FLAT	ORG	ORGANIC	WH	WEIGHT OF HAMMER
FRAG	FRAGMENTS	PP	POCKET PEN.	WR	WEIGHT OF RODS
GL	GRAVEL	PL	PLASTIC LIMIT	Y	YELLOW

ORDER OF DESCRIPTION

1) GROUP SYMBOL
2) SOIL GROUP NAME
3) PRIMARY COMPONENTS
4) SECONDARY COMPONENTS
5) MINOR COMPONENTS ;
6) COLOR
7) WEATHERING
8) STRUCTURE
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12) ORIGIN ;
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14) MOISTURE/WATER CONTENT
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SD: SIZE, GRADING
GL: SIZE, GRADING, SHAPE, ROCK TYPE

PROPORTIONS

"TRACE"	0 – 5%
"SOME"	5 – 12%
PREFIX "-Y"	12 – 35%
"AND"	35 – 50%

NON-COHESIVE SOILS

RELATIVE DENSITY		BLOWS
VERY LOOSE	VLS	0 – 4
LOOSE	LS	4 – 10
COMPACT	CP	10 – 30
DENSE	DN	30 – 50
VERY DENSE	VDN	>50

MOISTURE CONDITION

DRY	SOIL FLOWS
MOIST	FEELS COOL
WET	WITH FREE WATER

COHESIVE SOILS

CONSISTENCY		PP(TSF)	FINGER PRESSURE
VERY SOFT	VS	<0.25	EXTRUDES
SOFT	S	0.25 - 0.5	MOLDS EASILY
FIRM	FM	0.5 – 1	MOLDS
STIFF	ST	1 – 2	THUMB INDENTS
VERY STIFF	VST	2 – 4	THUMBNAIL INDENTS
HARD	H	>4	RESISTS THUMBNAIL

WATER CONTENT - W

W < PL	CANNOT ROLL 4 mm THREAD
W ~ PL	CAN ROLL THREAD 2 – 4 mm
W > PL	CAN ROLL THREAD <2 mm

ELEV. / DEPTH	LITHOLOGY	SPT N / PP (TSF)	SAMPLES NO.	SAMPLES TYPE	SAMPLES HAMMER BLOWS PER 6 IN	SAMPLES REC / ATT	DEPTH	SAMPLE DESCRIPTION AND DRILLING NOTES
623 / 0	0.0 - 10.0 BR fine SAND, moist Trace CCR							
621 / 1								
620 / 2								
619 / 3								
618 / 4	Dark brown silty sand, trace gravel, trace organics, 4-inch fragment of dark gray to black asphaltic cement, trace CCR		3077	Bag			4	Bag sample from dark lenses, some organics, some gravel, bitumenous asphalt
617 / 5								
616 / 6								
615 / 7								
614 / 8								
613 / 9								
612 / 10								

Golder Associates

Golder Associates

Field Test Pit Log

DEPTH HOLE 12 feet **PROJ. NO.** 177605
DEPTH SOIL DRILL --- **GA INSP.** APW
DEPTH ROCK CORE --- **WEATHER** 70 Sunny
ABANDONMENT Backfill, compacted
DEPTHS --- / --- / ---- / --- (WATER LEVEL / CAVE-IN / DATE-TIME / NOTE)
DEPTHS --- / --- / --- / --- (DELAYED) (WATER LEVEL / CAVE-IN / DATE-TIME / NOTE)

PROJECT BA Pond 3N
DRILLING METHOD Backhoe - Test Pit
DRILLING COMPANY Ryan Central
DRILL RIG ----- **DRILLER** ----
SAMPLER HAMMER TYPE ---- **WT.** ---- **DROP** ----
HOLE LOCATION North 467, East 2462

BORING NO. 3078
SHEET 1 **OF** 1
SURFACE ELEV. 626 to 614
DATUM Site Datum
STARTED 1550 (TIME) / 4/25/17 (DATE)
COMPLETED 1600 (TIME) / 4/25/17 (DATE)

SAMPLE TYPES

	A.S.	AUGER SAMPLE
	C.S.	CHUNK SAMPLE
*	D.O.	DRIVE OPEN (SPT)
	D.S.	DENISON SAMPLE
	F.S.	FOIL SAMPLE
	P.S.	PITCHER SAMPLE
	S.C.	SOIL CORE
*	T.O.	THIN-WALLED, OPEN
*	T.P.	THIN-WALLED, PISTON
	W.S.	WASH SAMPLE
*	___	_____
*	___	_____
*	___	_____

* NOTE SIZE

ABBREVIATIONS

ANG	ANGULAR	GR	GRAY	R	RED
BL	BLACK	HE	HETEROGENEOUS	RES	RESIDUAL
BR	BROWN	HO	HOMOGENEOUS	RX	ROCK
C	COARSE	LYD	LAYERED	RND	ROUNDED
CIN	CAVE-IN	M	MEDIUM	SAT	SATURATED
CO	COHESIVE	MIC	MICACEOUS	SD	SAND
CL	CLAY	MOT	MOTTLED	SI	SILT
CLY	CLAYEY	MST	MOIST	SIY	SILTY
D	DRY	NC	NON-COHESIVE	SM	SOME
EL	ELONGATED	NP	NON-PLASTIC	TR	TRACE
F	FINE	OG	ORANGE	WL	WATER LEVEL
FL	FLAT	ORG	ORGANIC	WH	WEIGHT OF HAMMER
FRAG	FRAGMENTS	PP	POCKET PEN.	WR	WEIGHT OF RODS
GL	GRAVEL	PL	PLASTIC LIMIT	Y	YELLOW

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10) CONTAMINATION
11) MINEROLOGY
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"AND"	35 – 50%

NON-COHESIVE SOILS

RELATIVE DENSITY		BLOWS
VERY LOOSE	VLS	0 – 4
LOOSE	LS	4 – 10
COMPACT	CP	10 – 30
DENSE	DN	30 – 50
VERY DENSE	VDN	>50

MOISTURE CONDITION

DRY	SOIL FLOWS
MOIST	FEELS COOL
WET	WITH FREE WATER

COHESIVE SOILS

CONSISTENCY		PP(TSF)	FINGER PRESSURE
VERY SOFT	VS	<0.25	EXTRUDES
SOFT	S	0.25 - 0.5	MOLDS EASILY
FIRM	FM	0.5 – 1	MOLDS
STIFF	ST	1 – 2	THUMB INDENTS
VERY STIFF	VST	2 – 4	THUMBNAIL INDENTS
HARD	H	>4	RESISTS THUMBNAIL

WATER CONTENT - W

W < PL	CANNOT ROLL 4 mm THREAD
W ~ PL	CAN ROLL THREAD 2 – 4 mm
W > PL	CAN ROLL THREAD <2 mm

ELEV. / DEPTH	LITHOLOGY	SPT N / PP (TSF)	SAMPLES NO.	SAMPLES TYPE	SAMPLES HAMMER BLOWS PER 6 IN	SAMPLES REC / ATT	DEPTH	SAMPLE DESCRIPTION AND DRILLING NOTES
626 0	0.0 - 10.0 BR fine SAND, moist Trace CCR							
625 1								
624 2								
623 3								
621 4								
620 5								
619 6								
618 7								
617 8								
616 9	Dark brown/gray sand with clay, trace organics		3078	Bag			9	Bag sample from dark lenses, some organics, some silt, some clay
615 10								
614 11								

Golder Associates

CEC J.H. Campbell Pond 3 North Test Pit Photo Documentation

Test Pit #: 3075
Location: North 461.288, East 2216.483
Bottom Elevation of Excavation: 613 Feet
Field Description: Approximately 3- to 4-inch thick layer of dark brown sand with trace clay. Dark material streaked downward on face of excavation by backhoe bucket.

CEC J.H. Campbell Pond 3 North Test Pit Photo Documentation

Test Pit #: 3076
Location: North 468.194, East 2171.272
Bottom Elevation of Excavation: 613 Feet
Field Description: Dark brown sand with silt, trace CCR in multiple 2- to 3-inch thick lenses

CEC J.H. Campbell Pond 3 North Test Pit Photo Documentation

Test Pit #: 3077
Location: North 473.928, East 2395.799
Bottom Elevation of Excavation: 612 Feet
Note: Dark brown silty sand with trace gravel, trace organics, trace CCR near crest of test pit.

CEC J.H. Campbell Pond 3 North Test Pit Photo Documentation

Test Pit #: 3078
Location: North 467.148, East 2462.118
Bottom Elevation of Excavation: 614 Feet
Note: Layer of dark brown/gray sand with clay, trace organics at toe of test pit.

Attachment 2 – Memorandum

Subject: Pond 3N Test Pit Material

Author: Wiss, Janney, Elstner Associates, Inc.

Date: May 3, 2017

WJE ENGINEERS ARCHITECTS MATERIALS SCIENTISTS

Wiss, Janney, Elstner Associates, Inc.
330 Pfingsten Road
Northbrook, Illinois 60062
847.272.7400 tel | 847.291.5189 fax
www.wje.com

MEMORANDUM

To: Halle Doering, Mark Bergeon, Hugh Davies, Matt Wachholz

From: Laura Powers

Date: May 3, 2017

Project: Pond 3N CEC JHC
WJE No. 2016.5469.1

Subject: Pond 3N Test Pit Material

This memo contains micrographs and descriptions of samples from Pond 3N Test Pit 3075, 3076, 3077, and 3078 that were submitted for additional laboratory analysis to address differences between the concentrations of CCR determined using colorimetry and microscopy in the field. The samples represent material that had been washed to remove silt, sieved to remove particles larger than 1.2 mm (No. 16 standard sieve), and analyzed in the field using colorimetry to determine CCR content (via the previously established calibration curve) and cross-checked by estimation of CCR content using a stereomicroscope. Results of field microscopy and colorimetry were comparable for the Test Pit 3075 sample, but differed for Test Pit 3076, 3077, and 3078 samples with colorimetry yielded higher values for CCR than field microscopy.

Laboratory Studies

Field determination of CCR content and the results of laboratory analysis of 250 to 300 particles in each sample are presented in Table 1. Micrographs of the 5 percent CCR reference standard are shown in Figure 1. Micrographs of the test pit samples are shown in Figures 2 through 5. The appearance of CCR particles removed from each sample are shown in Figures 6 through 9.

Siliceous sand grains are the major constituents of each sample. The grains are predominantly rounded to subangular and occasionally angular. Surfaces of rounded particles are highly polished. Most particles are light in color. Colorless transparent quartz and white to pink feldspars are the major components. Also observed were small amounts of darker colored sand particles that included dark red granite, black magnetite, green hornblende/schist, and red, brown, black, and gray volcanic rocks. *Yellow to red coatings of iron oxides/hydroxides were observed on some quartz particles. These coatings were more prevalent in the Test Pit 3077 and 3078 samples and are the possible cause of the discrepancy between the CCR concentrations determined by the colorimeter.*

CCR particles are readily distinguished by their shapes, color, and glassy appearance. Small amounts of CCR particles were observed in each sample. The particles mostly dark-colored (black, brown, dark green). Light-colored particles (light gray and beige) comprise a small portion of the CCR. Particle shapes range from angular and blocky to irregular and shard-like. Most particles are glassy and resemble slag. Irregularly shaped particle often appeared to frothy agglomerates of glassy materials. Spherical particles were infrequently observed.

Table 1. Field and Laboratory Measurement of CCR Content of Test Pit Samples

Sample	Colorimetry	Field Microscopy	Laboratory Microscopy	Laboratory Description
Test Pit 3075	2.53 percent	2 to 3 percent	2.6 percent	Mostly rounded grains of colorless and light-colored quartz and feldspar Darker colored sand grains are granite, magnetite (brown-black), volcanic rocks (brown, red, black, gray) Trace CCR particles: mostly dark colored, glassy and irregular to shard-like shapes
Test Pit 3076	4.80 percent	2 to 3 percent	2.9 percent	Mostly rounded to sub-angular grains of colorless and light-colored quartz and feldspar Darker colored sand grains are hornblende, granite, magnetite, volcanic rocks, and CCR Small amount of CCR particles: mostly dark-colored, angular and blocky to irregular and shard-like shapes
Test Pit 3077	7.98 percent	3 to 5 percent	3.8 percent	Rounded to sub-angular grains of colorless and light-colored quartz and feldspar Darker colored sand grains are granite, magnetite, volcanic rocks, and hornblende Small amount of CCR particles: mostly dark-colored, angular and blocky to irregular and shard-like shapes
Test Pit 3078	11.01 percent	1 to 2 percent	2.3 percent	Rounded to angular grains of colorless and light-colored quartz and feldspar; many grains coated with yellow to orange iron oxides/hydroxides Darker colored sand grains are magnetite, volcanic rocks, hornblende, granite, and trace CCR Trace CCR particles: mostly dark colored, glassy and irregular to shard-like shapes

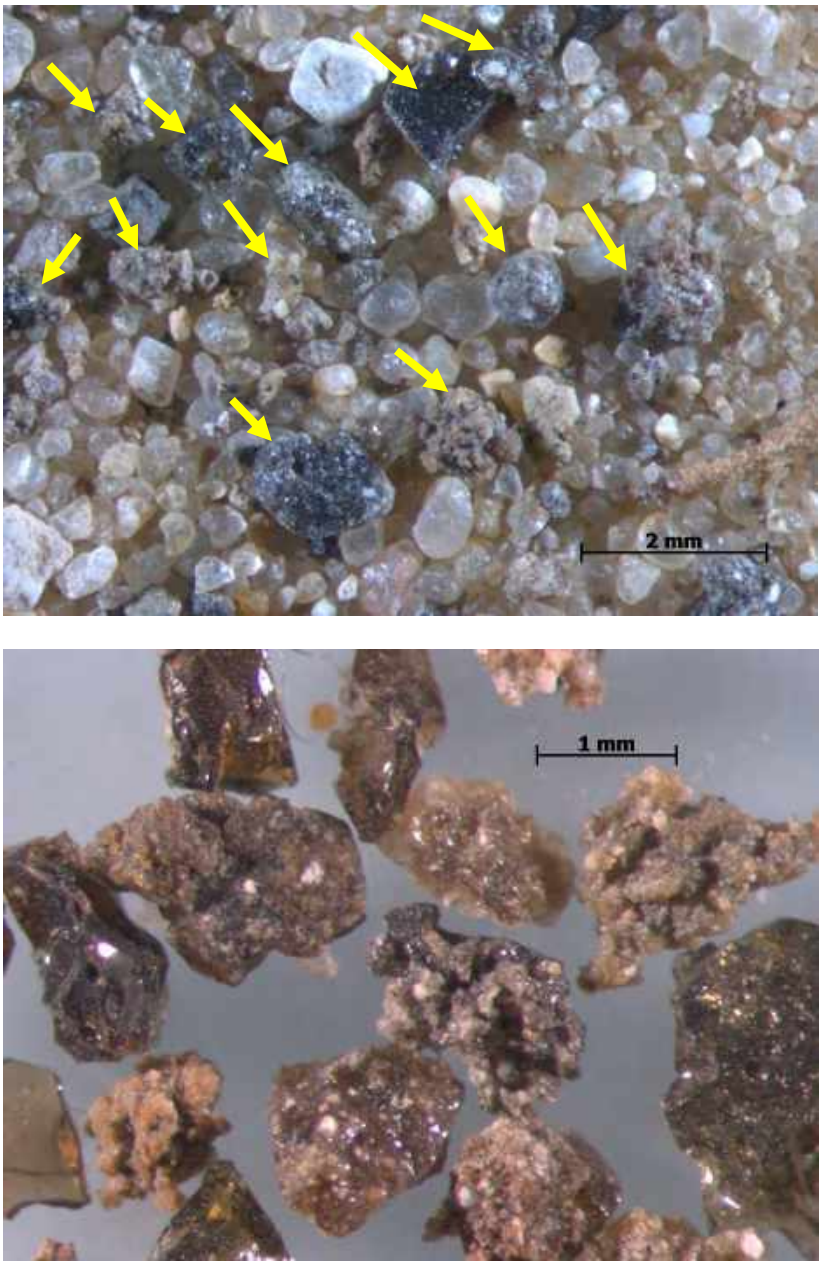

Figure 1. The appearance of the laboratory-prepared 5 percent CCR reference sample is shown at the top. The larger particles are shown with arrows. The micrograph at the bottom shows the angular and typically glassy appearance of the CCR particles removed from the sample.

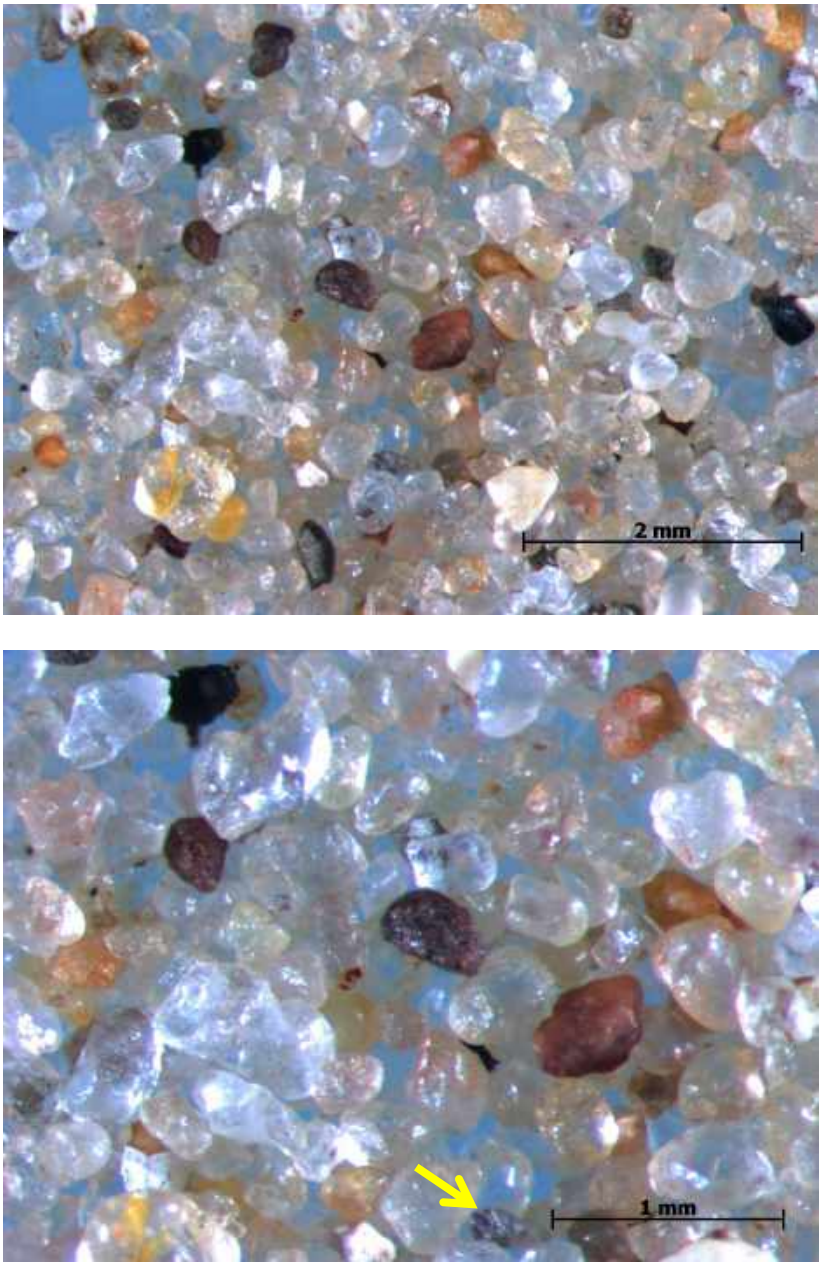

Figure 2. Test Pit 3075. Transparent quartz, some particles with iron oxide coatings, is the main constituent. Black particles are magnetite. Reddish particles are granite, potassium feldspar, and volcanic rock fragments that exhibit a similar degree of rounding as the quartz particles. Yellow arrow in bottom micrograph shows a CCR particle.

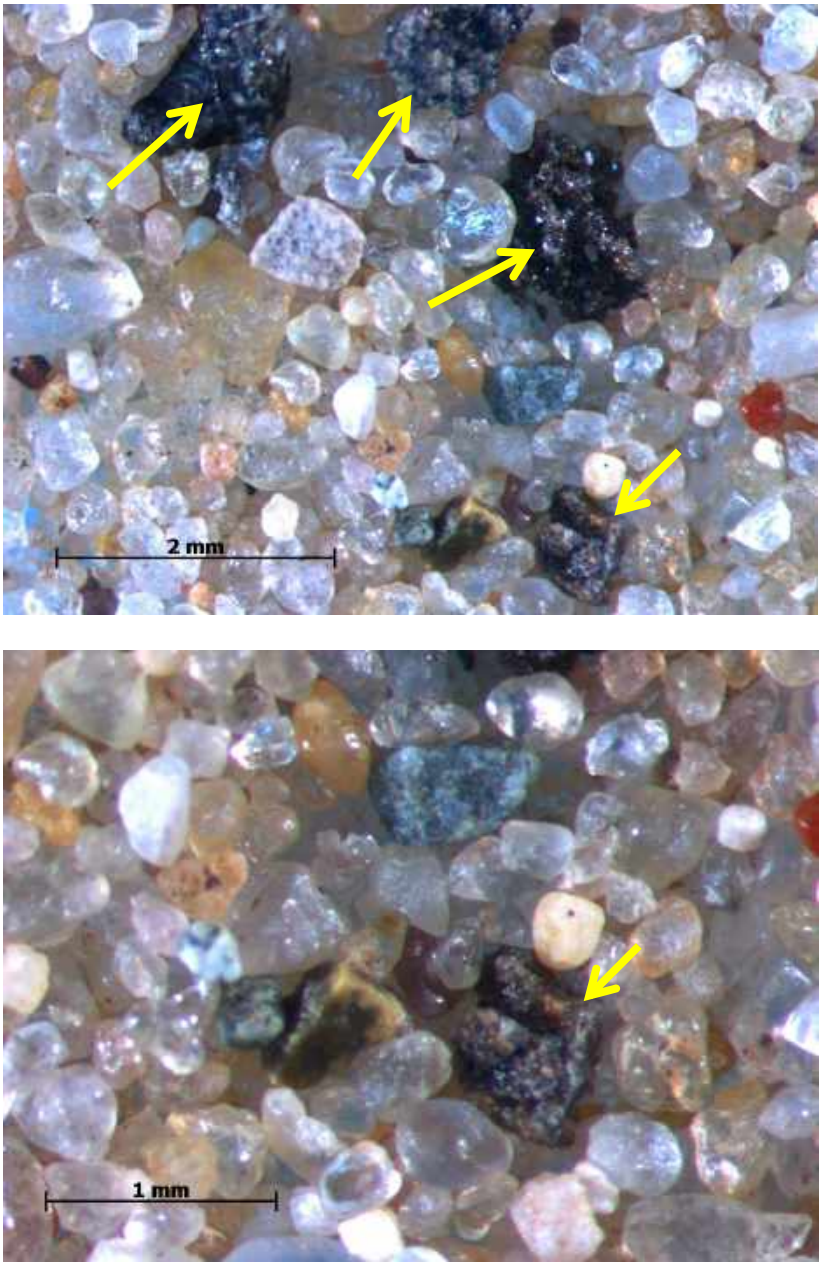

Figure 3. Test Pit 3076. The lighter colored grains are mostly quartz and feldspar. Green particles are hornblende. Yellow-green particle is chert. Arrows in top micrograph show blocky particles of CCR.

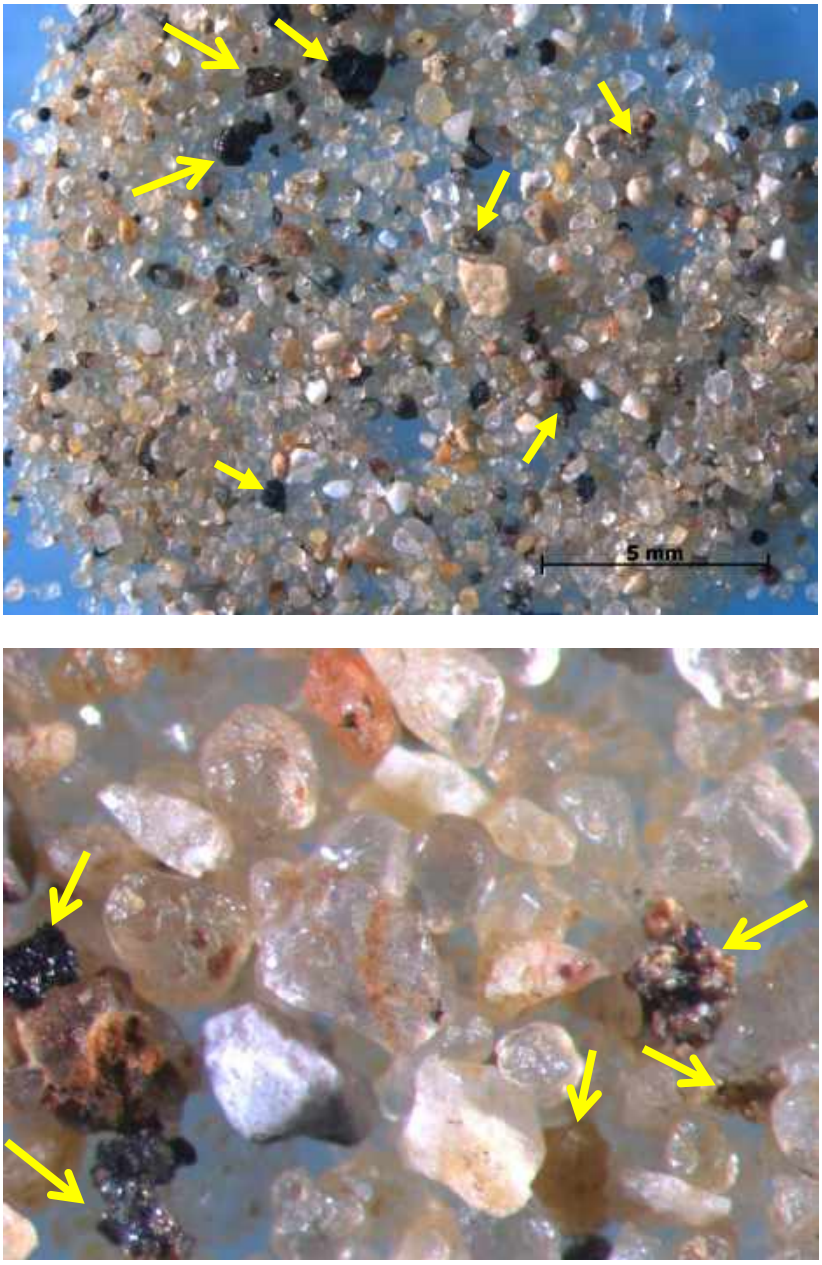

Figure 4. Test Pit 3077. The lighter colored grains are quartz, feldspar, and chert. Darker colored grains are granite, magnetite, volcanic rocks, and hornblende. The CCR particles are blocky, irregular, and shard-like slivers of colored glass.

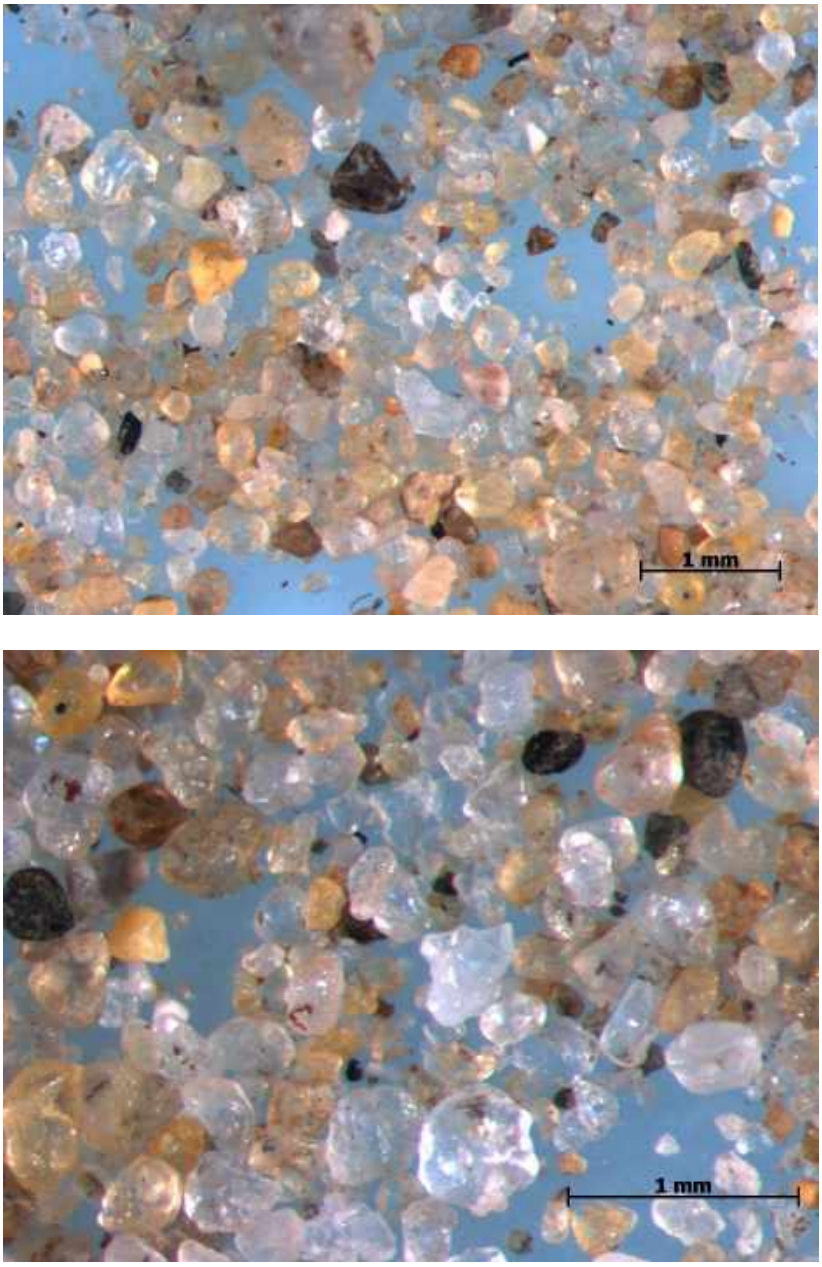

Figure 5. Test Pit 3078. Quartz is the main constituent. Many particles are coated with yellow iron oxides/hydroxides. Rounded darker colored particles magnetite, volcanic rocks, and hornblende. CCR particles are not present in the field of view.

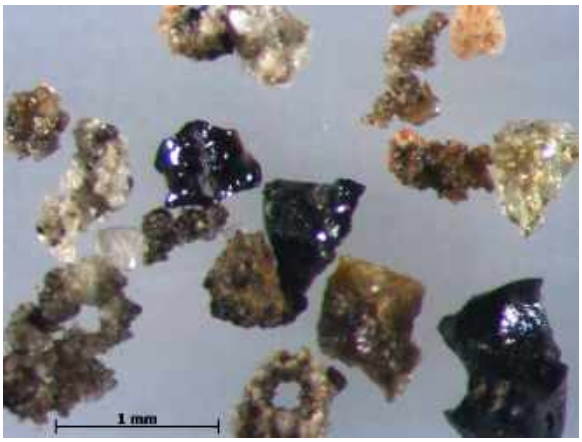

Figure 6. Examples of Test Pit 3075 bottom ash particles removed from the sample.

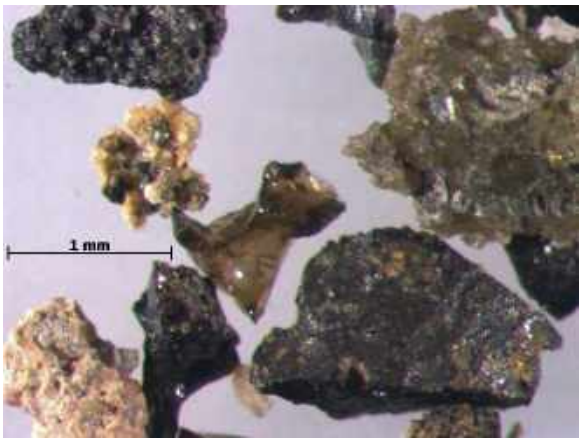

Figure 7. Examples of Test Pit 3076 bottom ash particles removed from the sample.

Figure 8. Examples of Test Pit 3077 bottom ash particles removed from the sample,

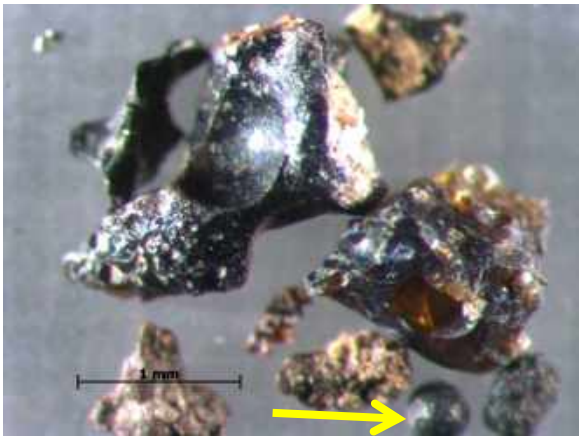

Figure 9. Examples of Test Pit 3078 bottom ash particles removed from the sample. Arrow shows a spherical particle.

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
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Europe	+ 356 21 42 30 20
North America	+ 1 800 275 3281
South America	+ 56 2 2616 2000

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Lansing, MI 48906 USA
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Fax: (517) 482-2460

Golder Associates

Engineering Earth's Development, Preserving Earth's Integrity

J.H. Campbell Generating Facility

Bottom Ash Pond 3 N/S - CCR Removal Documentation Report

Submitted to:

Consumers Energy Company
1945 W. Parnall Road
Jackson, Michigan USA 49201

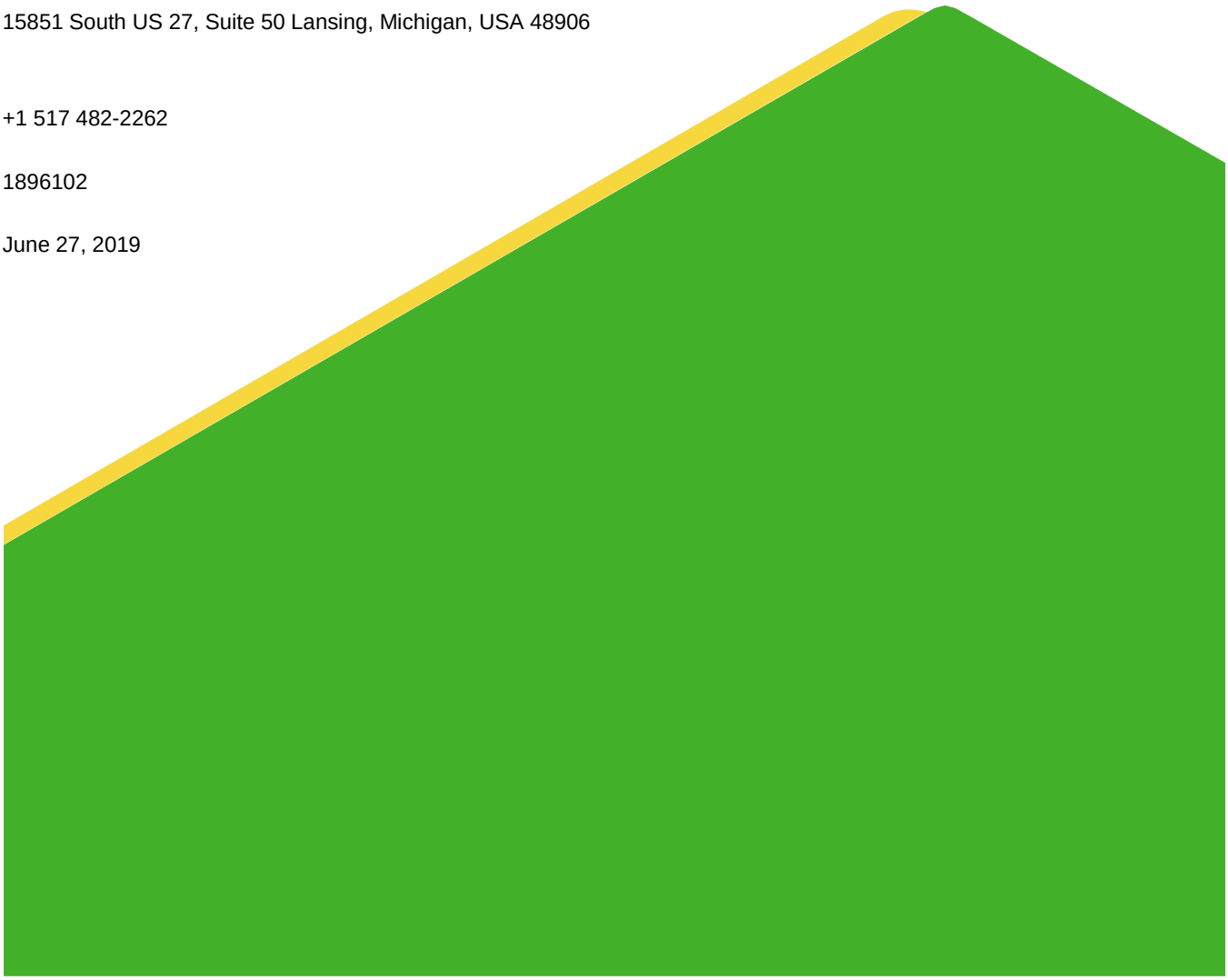
Submitted by:

Golder Associates Inc.
15851 South US 27, Suite 50 Lansing, Michigan, USA 48906

+1 517 482-2262

1896102

June 27, 2019



CERTIFICATION

Professional Engineer Certification Statement

I hereby certify that, having reviewed the attached documentation and being familiar with the *Consumers Energy J.H. Campbell Generating Facility Bottom Ash Ponds 3 N/S Closure Work Plan (Rev. 1)* (Closure Work Plan) submitted to the Michigan Department of Environment, Great Lakes, and Energy (EGLE) on January 27, 2017, I attest that this CCR Removal Documentation Report is accurate and the work documented was completed in substantial accordance with the requirements of the Closure Work Plan.

Golder Associates Inc.

Signature

June 27, 2019

Date of Report Certification

Jeffrey R. Piaskowski

Name

6201061033

Professional Engineer Certification Number

Executive Summary

This Coal Combustion Residuals (CCR) Removal Documentation Report (Report) has been prepared to document removal of CCR to decommission the Bottom Ash Pond 3 N/S CCR Surface Impoundment at the Consumers Energy Company's (CEC) J.H. Campbell Generating Facility (JH Campbell) located in West Olive, Michigan. This report consolidates the results of the *Bottom Ash Pond 3N CCR Removal Documentation Interim Report* dated June 20, 2017 and the results from the Pond 3S removal; as a result, this report provides final verification of CCR removal from the entire Bottom Ash Pond 3 N/S CCR unit as a regulated waste under Part 115, Solid Waste Management of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended.

Removal and documentation procedures were implemented as described in the Consumers Energy J.H. Campbell Generating Facility Bottom Ash Ponds 3 N/S Closure Work Plan (Rev. 1) (Closure Work Plan) submitted to the Michigan Department of Environment, Great Lakes, and Energy (EGLE, formerly MDEQ) on January 27, 2017. EGLE concurred with the Closure Work Plan in a letter dated February 23, 2017. CEC submitted the *Bottom Ash Pond 3N CCR Removal Documentation Interim Report* to EGLE on June 20, 2017 to document the removal of CCR from Bottom Ash Pond 3N and to meet EGLE's request for "submittal of a final certification that all solid waste has been removed along with the supporting documentation after completion of the removal activities." Following review of the interim report, EGLE provided a letter on July 18, 2017 concurring that bottom ash had been removed from Bottom Ash Pond 3N in accordance with the Closure Work Plan. This Report consolidates the results of the 2017 interim report and the results from the Pond 3S removal. It additionally supplements and adjusts the horizontal datum used when recording the investigation locations conducted in 2016 to match construction documentation obtained in 2017 and 2018 to allow for more accurate CCR removal documentation in accordance with the Closure Work Plan. This Report is being submitted to EGLE as a final certification that all solid waste has been removed from Bottom Ash Pond 3 N/S.

The multiple lines of evidence approach described in the Closure Work Plan and used to document CCR removal provides a predictable and reliable means to objectively measure concentrations of CCR based on physical sample properties. The approach takes advantage of the clear visible distinction between the color of the CCR and the color of the underlying soil documented in soil borings and during previous removal activities for beneficial reuse and pond cleanout.

The following information was obtained to document the CCR removal objective was met at the Bottom Ash Pond 3 N/S CCR Surface Impoundment at JH Campbell.

- First line of evidence – comparison of the excavation surface to known elevations of CCR from previous site characterizations and engineering records.

  Appendix A, Subsurface Investigation Data, provides the basis for establishing the proposed excavation surface. **Figure 2**, Bottom Ash Pond 3 N/S Excavation Surface, provides documentation of the excavation surface.

- Second line of evidence – photographic documentation including periodic photographs of CCR removal progression and photographs of excavated areas at random grid nodes.

  Appendix B, Bottom Ash Pond 3 N/S CCR Removal Photo Log and **Appendix C**, Bottom Ash Pond 3 N/S Grid Node Photographic Documentation Log provide photographic documentation of CCR removal.

Photographed grid node locations are illustrated on **Figure 4**, Bottom Ash Pond 3 N/S Photographed Grid Nodes.

- Third line of evidence - quantitative colorimetric analysis at random grid nodes to confirm CCR removal.

  Table 1, Bottom Ash Pond 3 N/S Colorimeter/Microscopy Results documents confirmation of CCR removal. Sampled grid node locations are illustrated on **Figure 5**, Bottom Ash Pond 3 N/S Colorimeter/Microscopy Grid Nodes.

- Alternative third line of evidence – microscopic quantification of CCR content where excavated areas are influenced by soils that do not match the site-specific colorimetric curve for Bottom Ash Pond 3 N/S.

  Table 1 documents confirmation of CCR removal. Sampled grid node locations are illustrated on **Figure 5**.

It is important to note two points of non-conforming documentation addressed within this certification. First, colorimetric documentation of CCR removal in 2017 yielded false-negative results when investigating suspect CCR identified in test pits 3075 - 3078. The false-negative results indicated that the CCR removal objective was not being met due to the presence of dark silty and dark organic soils in the berm fill. As a result, Golder developed an alternative third line of evidence, which was documented in a letter to EGLE dated May 25, 2017 (Pond 3 North Alternative Coal Combustions Residuals Removal Documentation). EGLE accepted the alternative line of evidence in a letter dated July 18, 2017 in response to the *Bottom Ash Pond 3N CCR Removal Documentation Interim Report*. The alternative third line of evidence (microscopic quantification) was used at eight grid nodes to document CCR removal in Bottom Ash Pond 3S.

Second, it is important to note that the interim report (Golder 2017) suggested that the northwest corner of Bottom Ash Pond 3N did not meet its proposed excavation surface, as clean sand was encountered prematurely when compared to proposed excavation depths. This discrepancy was resolved during Golder's internal technical quality assurance review of this document. Golder's internal review determined that the horizontal datum unit was set to U.S. survey feet when collecting the borehole locations during the 2016 investigations. The design and CCR removal operation utilizes horizontal datum set to international feet. The borehole locations were revised to international feet to align with the design and construction documents. Revising the units on the horizontal datum resulted in JHC-BH-16011 (and all other 2016 investigation locations) moving approximately 25 feet east of its previously reported location. Correcting the horizontal datum confirms that the excavated surface extended 1.1 feet below the observed CCR depth at BH-16011. The figures presented herein and subsurface investigation data presented in **Appendix A** have been revised accordingly and continue to provide confirmation of CCR removal in accordance with the Closure Work Plan.

Table of Contents

1.0 INTRODUCTION

1.1 Purpose

Consumers Energy Company (CEC) identified Bottom Ash Pond 3 N/S located at its J.H. Campbell Generating Facility (JH Campbell) in West Olive, Michigan (**Figure 1**) as an "existing CCR surface impoundment" under the Coal Combustion Residual (CCR) Resource Conservation and Recovery Act (RCRA) Rule (40 CFR 257 Subpart D) ("CCR RCRA Rule"), as it was directly receiving and storing commingled CCR and low volume miscellaneous wastewaters as of the effective date of the CCR RCRA Rule (October 19, 2015).

CEC developed the *Consumers Energy J.H. Campbell Generating Facility Bottom Ash Ponds 3 N/S Closure Work Plan (Rev. 1)* (Closure Work Plan). The Closure Work Plan was submitted to the Michigan Department of Environment Great Lakes, and Energy (EGLE, formerly MDEQ) on January 27, 2017; and EGLE concurred with the Closure Work Plan in a letter dated February 23, 2017. The Closure Work Plan was prepared to request agreement from EGLE on CEC's plan to close Bottom Ash Pond 3 N/S by removal of CCR and included general descriptions 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

This CCR Removal Documentation Report (Report) has been prepared to document and certify the removal of CCR from Bottom Ash Pond 3 N/S and is being submitted to meet the request from EGLE for "submittal of a final certification that all solid waste has been removed along with the supporting documentation after completion of the removal activities."

2.0 CCR REMOVAL AND DOCUMENTATION

Removal and documentation procedures were implemented as described in the Closure Work Plan. The Closure Work Plan presents that CCR removal would be confirmed using an objective standard of at least 95 percent CCR removal; meaning that following excavation of CCR, the remaining material left in place on the exposed surface would be comprised of no more than five percent CCR particles determined by weight. The 95 percent criterion is based on chemical analyses that have shown the criterion to be protective of groundwater based on non-residential drinking water and groundwater/surface water interface (GSI) criteria.

Colorimetric documentation of CCR removal in 2017 yielded false-negative results when investigating suspect CCR identified in test pits 3075 - 3078. The false-negative results indicated that the CCR removal objective was not being met due to the presence of dark silty and dark organic soils in the berm fill. As a result, Golder developed an alternative third line of evidence, which was documented in a letter to EGLE dated May 25, 2017 (Pond 3 North Alternative Coal Combustion Residuals Removal Documentation). EGLE accepted the alternative line of evidence in a letter dated July 18, 2017 in response to the *Bottom Ash Pond 3N CCR Removal Documentation Interim Report*.

During excavation operations, CCR removal was documented based on the following three lines of evidence:

- First line of evidence – comparison of the excavation surface 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.
- Alternative third line of evidence – microscopic quantification of CCR content where excavated areas are influenced by soils that do not match the site-specific colorimetric curve for Bottom Ash Pond 3 N/S.

2.1 Narrative Description of CCR Removal

During March 2017, April 2017, and May 2017, Ryan Incorporated Central (Ryan) was retained by CEC to perform excavation activities to remove CCR from Bottom Ash Pond 3N. Ryan was retained by CEC to perform excavation activities to remove CCR from Bottom Ash Pond 3S in October and November 2018. Documentation was collected by Golder Associates Inc. (Golder) to provide lines of evidence to confirm that 95 percent of the CCR was removed per the Closure Work Plan. During CCR removal and documentation, the following tasks were completed:

- Bottom Ash Pond 3 N/S was dewatered by actively pumping decant water into an overflow ditch and ultimately through the site treatment system and National Pollutant Discharge Elimination System (NPDES) permitted outfall.
- CCR was removed by excavation until CCR was no longer visually observed on the excavation surfaces.
- Final excavation grades were compared to apparent elevations where CCR was noted in borehole logs from previous site characterizations.
- A 50-foot grid with a total of 173 nodes was established across the limits of Bottom Ash Pond 3 N/S.
- Photographic documentation was conducted of the general CCR removal operation.
- Photographic documentation of excavated areas was completed on at least 50 percent of the grid nodes.
- Quantitative colorimetric analysis was completed on at least 25 percent of the grid nodes (50 percent of the photographed grid nodes).
- Quantitative microscopic analysis was completed as an alternative to colorimetric analysis where soils on excavated surfaces did not match the site-specific colorimetric curve.

2.2 Documentation of Excavation Grades – First Line of Evidence

The first line of evidence to assess CCR removal activities was confirmation that excavations were completed to at least the elevation established as the base of CCR from existing information. The elevation of the base of CCR (proposed CCR excavation limits) was established based on subsurface investigations completed in Bottom Ash Pond 3 N/S. The subsurface investigations included the following boreholes and test pits, which are presented on **Figure 2** and recorded in **Appendix A**:

- JHC-BH-16001
- JHC-BH-16002
- JHC-BH-16003
- JHC-BH-16004
- JHC-BH-16011
- JHC-BH-16012
- JHC-BH-16013
- JHC-BH-16014
- JHC-BH-16015
- JHC-BH-16016
- 3B-1
- 3B-2
- 3B-3
- 3B-4
- TP 1
- TP 2
- TP 3
- TP 3075
- TP 3076
- TP 3077
- TP 3078

Visual observations for the presence of CCR were completed during excavation activities until CCR were no longer visible to the naked eye in the materials present on the excavation surface. As the base and side slopes of the excavation approached the proposed CCR excavation limits, the field observations were compared to the material descriptions in the boring logs to assist in selecting the limit of excavation. The base of excavation was at or below anticipated CCR elevations at subsurface investigation locations with the exception of JHC-BH-16001 in Bottom Ash Pond 3N and JHC-BH-16003 in Bottom Ash Pond 3S, where the excavation surface was 0.38 feet and 0.58 feet above the anticipated base of CCR, respectively. A test pit was conducted at JHC-BH-16001 during CCR removal to document that the excavation met the CCR removal objective (95 percent CCR removal). The area surrounding JHC-BH-16003 was determined to meet the CCR removal objective after it was visually inspected by Golder's quality assurance technician. An additional grid node (Grid Node 69) was photographed to further document CCR removal in this area.

It is important to note that the interim report (Golder 2017) suggested that the northwest corner of Bottom Ash Pond 3N did not meet its proposed excavation surface, as clean sand was encountered prematurely when compared to proposed excavation depths. This discrepancy was resolved during Golder's internal technical quality assurance review of this document. Golder's internal review determined that the horizontal datum unit was set to U.S. survey feet when collecting the borehole locations during the 2016 investigations. The design and CCR removal operation utilizes horizontal datum set to international feet. The borehole locations were revised to international feet to align with the design and construction documents. Revising the units on the horizontal datum resulted in JHC-BH-16011 (and all other 2016 investigation locations) moving approximately 25 feet east of its previously reported location. Correcting the horizontal datum confirms that the excavated surface extended 1.1 feet below the observed CCR at BH-16011. The figures presented herein and subsurface investigation data presented in **Appendix A** have been revised accordingly and continue to provide confirmation of CCR removal in accordance with the Closure Work Plan.

2.3 Photographic Documentation – Second Line of Evidence

Consistent with EGLE guidance, *Sampling Strategies and Statistics Training Materials for Part 201 Cleanup Criteria (S3TM)*, a 50-foot grid with a total of 173 nodes was established across the limits of Bottom Ash Pond 3 N/S for assessment of CCR removal. The grid is illustrated on **Figure 3**. Confirmation by visual assessment and photographic documentation was completed on at least 50 percent of the grid nodes selected using a random number generator. The locations of the 89 grid nodes selected for photographic documentation are illustrated on **Figure 4**.

Each grid node was inspected visually to identify whether residual CCR was present on the exposed surface of the excavation. If CCR were visible, additional material was removed. When no or only minor visible signs of CCR was observed, photographs and written descriptions were taken to document the material left in place at the 89 randomly selected grid nodes. The photography procedure was standardized such that it included the following elements:

- Photographs were taken during construction to document general CCR removal means and methods.
- Photographs were taken of a representative sample area measuring one-square-foot that contained surficial materials present at the base of the excavation at each randomly selected grid node.
- Photographs were taken from a standardized height so that the same area and level of detail is shown by each photograph.

Photographs documenting general CCR removal means and methods are included in **Appendix B**. Photographic documentation of the selected grid nodes are included in **Appendix C**.

2.4 Colorimetric – Third Line of Evidence

As described in the Closure Work Plan, a colorimetric analysis utilizing a digital colorimeter to precisely measure the color of a soil sample was developed to confirm CCR removal. Soil samples were collected from the base of the excavation at randomly selected grid nodes using the same grid node selection methodology developed for the photographic documentation (i.e., colorimetric confirmation was conducted on at least 50 percent of the photographed nodes or at least 25 percent of the total grid nodes). The 47 grid nodes that were selected for colorimetric confirmation are illustrated on **Figure 5**. Colorimetric confirmation results for each sampled grid node are included in **Table 1**.

The colorimetric testing was conducted with a Konica-Minolta CR-400 colorimeter in general accordance with ASTM E1347, Standard Test Method for Color and Color-Difference Measurement by Tristimulus Colorimetry. In accordance with the Closure Work Plan, a site-specific color-concentration calibration curve was developed (using samples collected prior to CCR removal) to confirm the 95 percent CCR removal objective was achieved. All sampled grid nodes passed colorimetric confirmation testing except eight grid nodes that were influenced by soils that did not match the site-specific colorimetric curve for Bottom Ash Pond 3 N/S. CCR removal at the eight grid nodes that did not pass colorimetric analysis was confirmed through the alternative third line of evidence described in Section 2.5 of this report.

It should be noted that one minor clarification to the methodology presented in the Closure Work Plan was made and accepted by EGLE in 2017 during field implementation at Bottom Ash Pond 3N. If the CCR content of a sample was measured in the range of 4.5 percent to 5.5 percent, the sample was tested three additional times using the remaining portion of the sample, split three times. This repeated sub-sampling and analysis resulted in the testing of four splits of a sample, from which the average CCR content was reported. This clarification and additional testing was used at Grid Node #75. The remainder of the grid node colorimetry analyses yielded results of 4.5 percent or less CCR.

2.5 Microscopy – Alternative Third Line of Evidence

While documenting CCR removal in 2017, dark materials were observed that did not meet visual CCR removal objectives in the Bottom Ash Pond 3 N/S berm fill. Additionally, these materials did not meet CCR removal objectives when tested with colorimetric methods. The darker materials were not consistent with CCR present

elsewhere within Bottom Ash Pond 3 N/S; therefore, four test pits were completed in the north face of the Bottom Ash Pond 3 N/S center berm. Test pit samples were split, dried, and examined at Wiss Janey Elstner Associates (WJE) with a stereomicroscope. The CCR content in each sample was enumerated on a percentage basis using a point count analysis when compared to a premixed standard. The WJE microscopic laboratory analysis was documented in a memo dated May 3, 2017 and determined that the darker materials visually observed in the berm fill were due to the presence of silty and organic soils that were not consistent with the site-specific colorimetric curve.

Based on the WJE microscopic laboratory analysis results, Golder proposed microscopy as an alternative third line of evidence in a letter to EGLE dated May 25, 2017 (Pond 3 North Alternative Coal Combustions Residuals Removal Documentation). EGLE accepted the alternative line of evidence in a letter dated July 18, 2017 in response to the *Bottom Ash Pond 3N CCR Removal Documentation Interim Report*.

The alternative third line of evidence that documented CCR removal at the Bottom Ash Pond 3N berm was also used to document CCR removal at the following eight grid nodes where colorimetry analysis resulted in false-negatives.

- Grid Node #2
- Grid Node #7
- Grid Node #11
- Grid Node #35
- Grid Node #83
- Grid Node #85
- Grid Node #107
- Grid Node #141

Microscopy was used to document the third line of evidence at eight grid nodes as illustrated on **Figure 5**. Microscopy confirmation results for each sampled grid node are summarized in **Table 1.** A memo provided by CTL Group that documents at least 95 percent CCR removal at these grid nodes is provided in **Appendix D**, CTL Group CCR Removal Microscopy Memo.

3.0 SUMMARY

CCR removal and documentation procedures were implemented as described in the Closure Work Plan submitted to EGLE on January 27, 2017. Where the proposed lines of evidence to support CCR removal were not documentable, an alternative line of evidence was documented to support CCR removal met closure objectives. The multiple lines of evidence indicate that CCR has been removed from Bottom Ash Pond 3 N/S at JH Campbell.

The multiple lines of evidence approach provided a predictable and reliable means to objectively measure concentrations of CCR based on physical sample properties and confirmed that the materials remaining on the base of the excavation contained no visually identifiable CCR and documented at least 95 percent CCR removal when tested by colorimetric or microscopic methods.

During excavation operations, CCR removal was documented based on the following three lines of evidence:

- First line of evidence – comparison of the excavation surface to known elevations of CCR from previous site characterizations and engineering records.
- Second line of evidence – photographic documentation including periodic photographs during CCR removal and photographs of excavated areas at random grid nodes.
- Third line of evidence - quantitative colorimetric analysis at random grid nodes to confirm CCR removal.

- Alternative third line of evidence – microscopic quantification of CCR content where excavated areas are influenced by soils that do not match the site-specific colorimetric curve for Bottom Ash Pond 3 N/S.

This report has been prepared to document the removal of solid waste from Bottom Ash Pond 3 N/S and is being submitted to meet the request from EGLE for “submittal of a final certification that all solid waste has been removed along with the supporting documentation after completion of the removal activities.”

Standard of Care

Golder has prepared this report in a manner consistent with the level of care and skill ordinarily exercised by members of the engineering and science professions currently practicing under similar conditions in the jurisdiction in which the services are provided, subject to the time limits and physical constraints applicable to this report. No other warranty, expressed or implied, is made.

Signature Page

Golder Associates Inc.

Jeff Piaskowski, P.E.
Senior Project Engineer

Mark Bergeon, P.G.
Program Leader and Associate

Tables

CEC J.H. Campbell Pond 3N/S
Pond 3N/S CCR Removal
Golder Project No. 1896102

GOLDER

Table 1: Colorimeter/Microscopy Results - Sampled Grid Nodes							
Node/ Location	**Northing**	**Easting**	**Date Sampled**	**Color Value (RGB integer)**	**Colorimeter CCR (%)**	**Microscopic Estimation of CCR (%)**	**Pass/ Fail (less than 5%)**
2[(a)]	50	2050	10/2/2018	(a)	(a)	-	**Fail**
2R1[(a)]	50	2050	10/15/2018	(a)	(a)	-	**Fail**
2R2[(a)]	50	2050	10/16/2018	(a)	(a)	2	**Pass**
7[(a)]	300	2050	10/2/2018	(a)	(a)	1	**Pass**
11[(a)]	50	2100	10/12/2018	(a)	(a)	3	**Pass**
13	150	2100	10/11/2018	10914664	4.24	-	**Pass**
19	450	2100	4/21/2017	11042647.13	2.36	-	**Pass**
21	550	2100	4/11/2017	11368698.56	0.00	-	**Pass**
27	850	2100	4/27/2017	10995395.26	2.70	-	**Pass**
28[(b)]	0	2150	10/2/2018	11572073	0.00	-	**Pass**
30[(b)]	100	2150	10/12/2018	11441523	0.00	-	**Pass**
35[(a)]	350	2150	10/10/2018	(a)	(a)	1	**Pass**
36	400	2150	4/27/2017	11156685.54	1.53	-	**Pass**
42	700	2150	4/12/2017	10981394.83	2.80	-	**Pass**
44	800	2150	4/26/2017	10934517.05	3.14	-	**Pass**
51[(b)]	250	2200	10/15/2018	11507056	0.00	-	**Pass**
52	300	2200	10/15/2018	11375212	0.04	-	**Pass**
59	650	2200	4/13/2017	10820469.41	3.96	-	**Pass**
61	750	2200	4/12/2017	11132703.00	1.71	-	**Pass**
62	800	2200	4/26/2017	11379298.9	0.00	-	**Pass**
63	850	2200	4/26/2017	11231183.92	0.99	-	**Pass**
66[(b)]	100	2250	10/12/2018	11442810	0.00	-	**Pass**

CEC J.H. Campbell Pond 3N/S
Pond 3N/S CCR Removal
Golder Project No. 1896102

GOLDER

Table 1: Colorimeter/Microscopy Results - Sampled Grid Nodes							
Node/ Location	**Northing**	**Easting**	**Date Sampled**	**Color Value (RGB integer)**	**Colorimeter CCR (%)**	**Microscopic Estimation of CCR (%)**	**Pass/ Fail (less than 5%)**
75A[(c)]	550	2250	4/13/2017	10615760.27	5.44	-	**Pass**
75B[(c)]	550	2250	4/13/2017	10745414.56	4.51		
75C[(c)]	550	2250	4/13/2017	10740981.12	4.54		
75D[(c)]	550	2250	4/13/2017	10739190.56	4.55		
75 Average[(c)]	550	2250	4/13/2017	10710336.63	4.76		
83[(a)]	50	2300	10/15/2018	(a)	(a)	1	**Pass**
85[(a)]	150	2300	10/15/2018	(a)	(a)	2	**Pass**
86	200	2300	10/15/2018	10456435	11.03	-	**Fail**
86R	200	2300	10/16/2018	11706760	0.00	-	**Pass**
98	800	2300	4/26/2017	11280366.81	0.64	-	**Pass**
102	100	2350	10/17/2018	10915436	4.23	-	**Pass**
103	150	2350	10/17/2018	11047022	2.76	-	**Pass**
107[(a)]	350	2350	10/15/2018	(a)	(a)	1	**Pass**
110	500	2350	5/2/2017	10830765.62	3.89	-	**Pass**
111	550	2350	4/18/2017	11187648.36	1.31	-	**Pass**
114	700	2350	4/18/2017	11267293.93	0.73	-	**Pass**
116	800	2350	4/26/2017	11154188.51	1.55	-	**Pass**
117	850	2350	4/26/2017	11188240.87	1.30	-	**Pass**
123	250	2400	10/17/2018	11048829	2.74	-	**Pass**
133	750	2400	4/18/2017	11346285.27	0.16	-	**Pass**
134	800	2400	4/26/2017	11320673.43	0.35	-	**Pass**
141[(a)]	300	2450	11/17/2018	(a)	(a)	2	**Pass**
145	500	2450	5/2/2017	11122970.41	1.78	-	**Pass**
146	550	2450	4/19/2017	11437070.75	0.00	-	**Pass**

Table 1: Colorimeter/Microscopy Results - Sampled Grid Nodes							
Node/ Location	**Northing**	**Easting**	**Date Sampled**	**Color Value (RGB integer)**	**Colorimeter CCR (%)**	**Microscopic Estimation of CCR (%)**	**Pass/ Fail (less than 5%)**
148	650	2450	4/14/2017	10983509.04	2.79	-	**Pass**
149	700	2450	4/14/2017	11177655.84	1.38	-	**Pass**
155	200	2500	10/11/2018	10979940	3.48	-	**Pass**
160	450	2500	4/27/2017	11069778.75	2.16	-	**Pass**
162	550	2500	4/20/2017	11200806.76	1.21	-	**Pass**
169	650	2550	4/27/2017	11108640.73	1.88	-	**Pass**
172	800	2550	4/21/2017	11271384.88	0.70	-	**Pass**
173	850	2550	4/21/2017	11122408.99	1.78	-	**Pass**
JHC BH-16001[(d)]	679	2185	4/18/2017	11032189.64	2.43	-	**Pass**

(a): Quantitative colorimeter analyses were not practicable for these samples due to the sand color variations and dark organics and other material present in the samples which made them inappropriate for comparison to the colorimeter curve calculated using brown sand and CCR samples.

(b): Colorimeter calculated concentration is less than the reference range, and referred to as non detectable (ND).

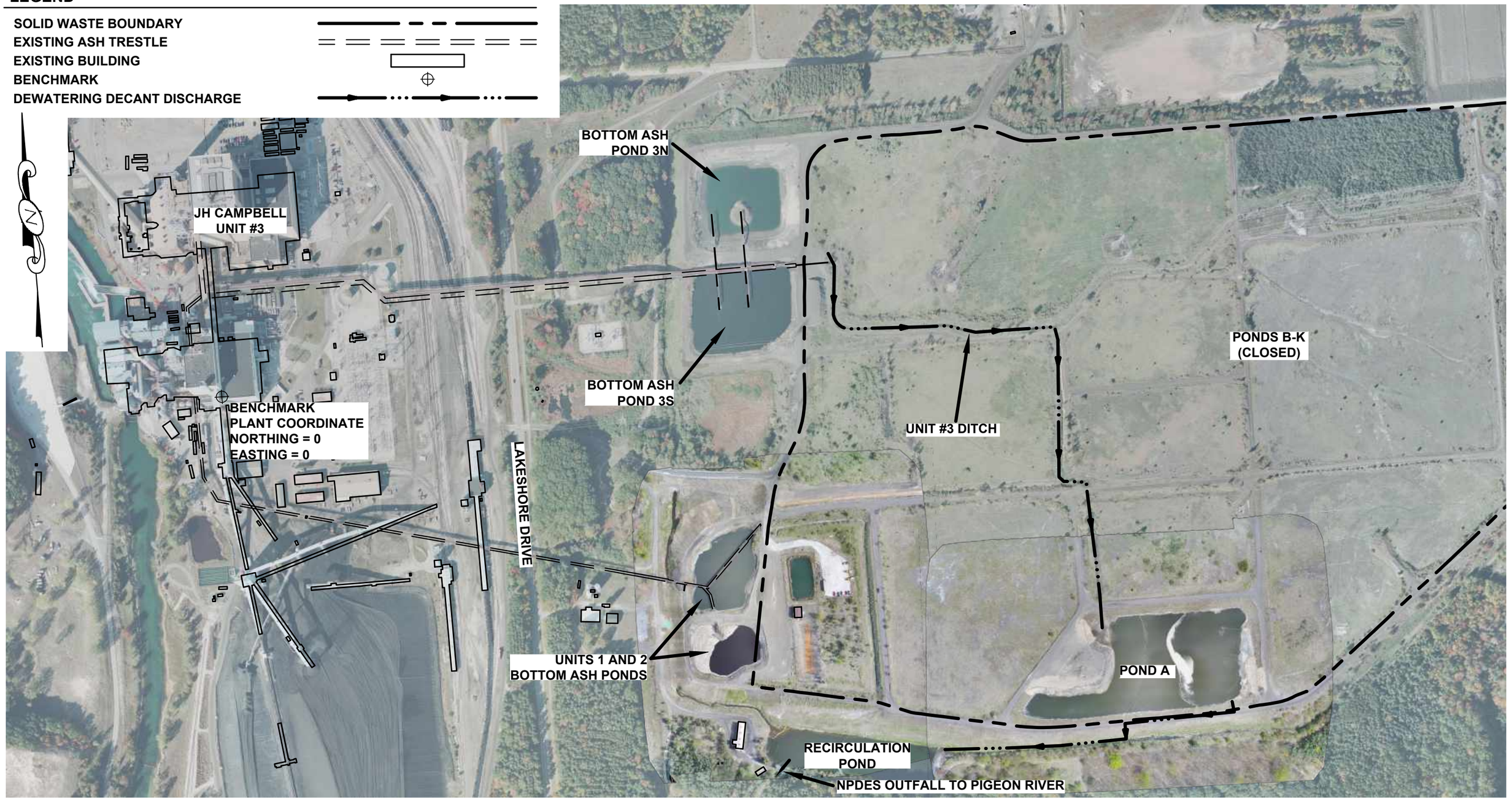
(c): If a sample yielded a percent CCR between 4.5% and 5.5%, three additional splits of the sample were analyzed (A, B, C, and D are separately tested splits of the sample). The average of the four results were reported as the percent CCR for the node.

(d): Location added for confirmation purposes as described in Section 2.5.1 of this report.

Figures

LEGEND

- SOLID WASTE BOUNDARY
- EXISTING ASH TRESTLE
- EXISTING BUILDING
- BENCHMARK
- DEWATERING DECANT DISCHARGE



REV	DATE	DESCRIPTION	BY	CHK	APP
	03-13-19	ISSUED FOR FINAL REPORT	MAS	HAD	MAB
	11-30-18	ISSUED FOR DRAFT REPORT	MAS	HAD	MAB

SIGNATURE

NAME

MICHIGAN P.E. NO.

Consumers Energy

J.H. CAMPBELL ASH STORAGE FACILITY

JH CAMPBELL BOTTOM ASH POND 3 N/S

SITE OVERVIEW

SCALE	1" = 400'	DRAWING NO.	FIGURE	REV.
JOB			1	

NOTES

1. COORDINATES SHOWN ARE ON THE J.H. CAMPBELL LOCAL PLANT DATUM
2. ELEVATIONS SHOWN ARE ON THE J.H. CAMPBELL LOCAL PLANT DATUM (NGVD 29).
3. EXCAVATED CONTOURS SHOWN FOR POND 3 NORTH ARE FROM THE APRIL 17, 2017 THROUGH THE MAY 3, 2017 SURVEYS. EXCAVATED CONTOURS SHOWN FOR POND 3 SOUTH ARE FROM THE POST-EXCAVATION SURVEY DATA PROVIDED BY RYAN INCORPORATED CENTRAL ON NOVEMBER 12, 2018.
4. DATA USED TO ESTABLISH DESIGN ELEVATION FOR BASE OF CCR:

Boring / Test Pit	NORTHING	EASTING	Base of CCR Elevation / Top of Test Pit	Base of Excavation Elevation	Difference
JHC-BH-16001	679	2210	598.75	599.13	0.38*
JHC-BH-16002	596	2386	600.12	598.78	-1.34
JHC-BH-16003	233	2260	599.22	599.80	0.58**
JHC-BH-16004	233	2386	601.64	599.39	-2.25
JHC-BH-16011	785	2182	602.10	600.99	-1.11
JHC-BH-16012	695	2458	600.60	599.58	-1.01
JHC-BH-16013	520	2250	601.50	600.48	-1.01
JHC-BH-16014	306	2334	602.20	599.66	-2.54
JHC-BH-16015	98	2140	601.00	600.69	-0.31
JHC-BH-16016	98	2229	602.70	600.00	-2.70
3B-1	399	2197	625.43	623.65	-1.77
3B-2	428	2199	631.46	625.99	-5.46
3B-3	387	2352	625.79	620.00	-5.78
3B-4	420	2355	632.51	627.25	-5.26
TP 1	-13	2198	627.2	623.72	-3.48
TP 2	2	2069	624.7	621.99	-2.71
TP 3	122	2053	619.7	609.20	-10.50
TP 3075	461	2216	621.00	617.60	-3.40
TP 3076	468	2171	625.00	616.65	-8.35
TP 3077	474	2396	623.00	615.42	-7.58
TP 3078	467	2462	626.00	618.54	-7.46

*A TEST PIT WAS CONDUCTED AT JHC-BH-16001, MATERIAL WAS SAMPLED AND CONFIRMED TO BE LESS THAN 5% CCR BY MICROSCOPY.
** THIS LOCATION AND SURROUNDING AREA WAS VISUALLY INSPECTED FOR PRESENCE OF CCR. PLEASE SEE GRID NODE 69 FOR REPRESENTATIVE PHOTOGRAPH OF THIS AREA.

LEGEND

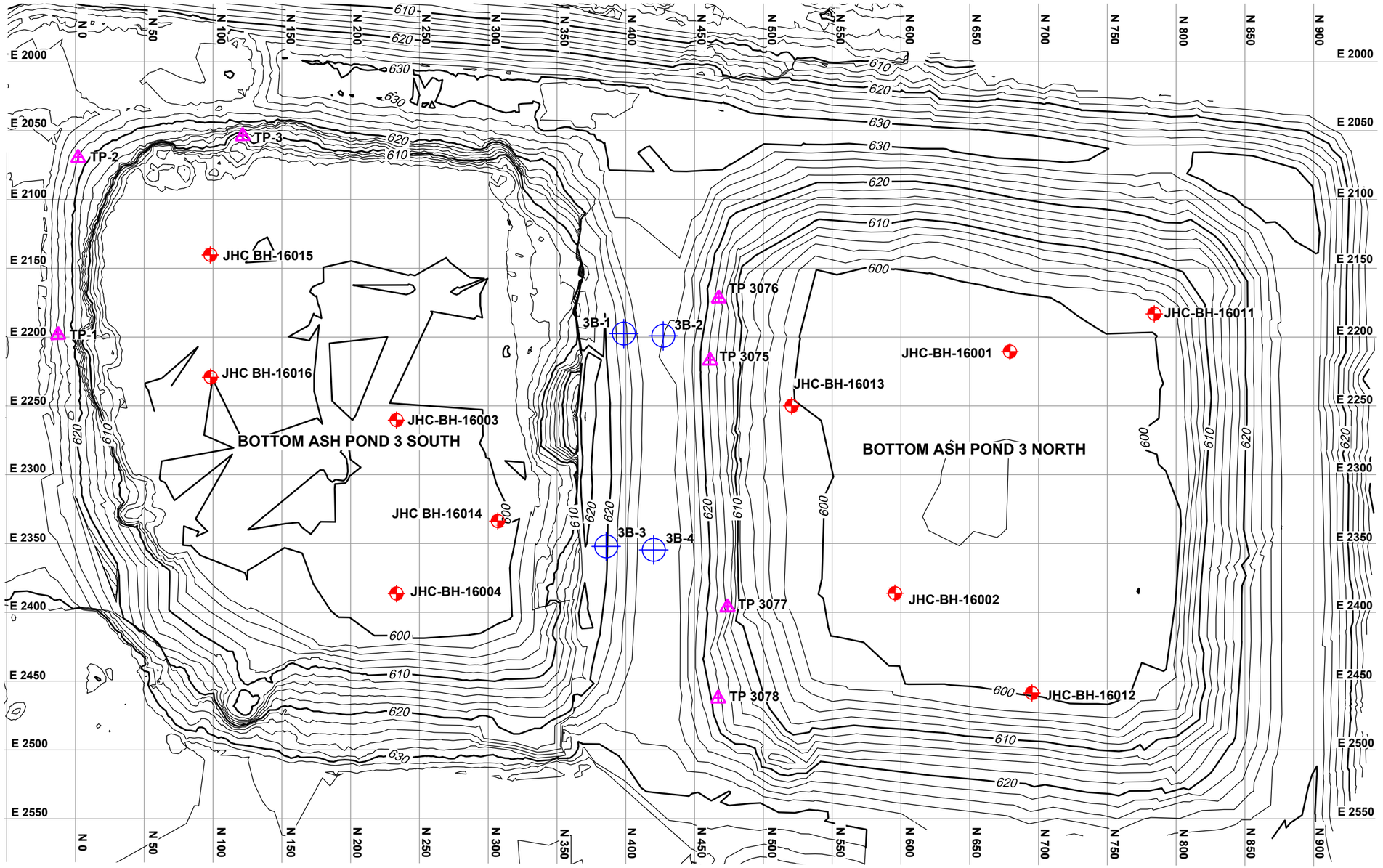
MAJOR CONTOUR (5 FT INTERVAL)

MINOR CONTOUR (1 FT INTERVAL)

2016 SOIL BORING LOCATION

HISTORICAL BORING LOCATION

TEST PIT LOCATION



REV	DATE	DESCRIPTION	BY	CHK	APP
	04-12-19	ISSUED FOR FINAL REPORT	DJS	JRP	MAB
	12-10-18	ISSUED FOR DRAFT REPORT	MAS	HAD	MAB

SIGNATURE

NAME

MICHIGAN P.E. NO.

Consumers Energy

J.H. CAMPBELL ASH STORAGE FACILITY

JH CAMPBELL BOTTOM ASH POND 3 N/S

CCR REMOVAL DOCUMENTATION - EXCAVATION SURFACE

SCALE	1" = 80'	DRAWING NO.	FIGURE	REV.
JOB			2	

NOTES

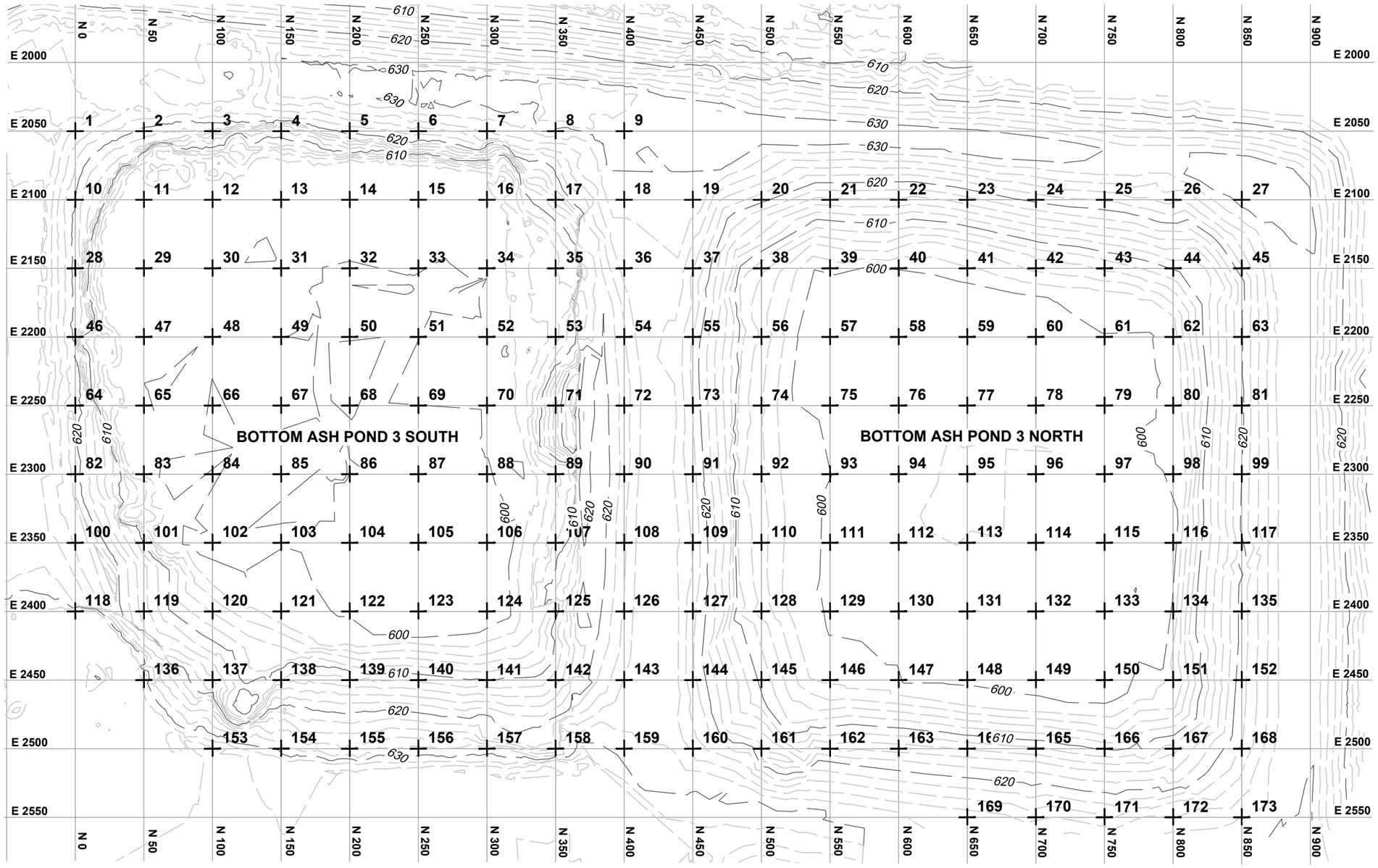
1. COORDINATES SHOWN ARE ON THE J.H. CAMPBELL LOCAL PLANT DATUM
2. ELEVATIONS SHOWN ARE ON THE J.H. CAMPBELL LOCAL PLANT DATUM (NGVD 29).
3. EXCAVATED CONTOURS SHOWN FOR POND 3 NORTH ARE FROM THE APRIL 17, 2017 THROUGH THE MAY 3, 2017 SURVEYS. EXCAVATED CONTOURS SHOWN FOR POND 3 SOUTH ARE FROM THE POST-EXCAVATION SURVEY DATA PROVIDED BY RYAN INCORPORATED CENTRAL ON NOVEMBER 12, 2018.

LEGEND

MAJOR CONTOUR (5 FT INTERVAL)

MINOR CONTOUR (1 FT INTERVAL)

GRID NODE



REV	DATE	DESCRIPTION	BY	CHK	APP
	04-12-19	ISSUED FOR FINAL REPORT	DJS	JRP	MAB
	12-10-18	ISSUED FOR DRAFT REPORT	MAS	HAD	MAB

SIGNATURE

NAME

MICHIGAN P.E. NO.

Consumers Energy

J.H. CAMPBELL ASH STORAGE FACILITY

JH CAMPBELL BOTTOM ASH POND 3 N/S

CCR REMOVAL DOCUMENTATION - SAMPLE GRID NODES

SCALE	1" = 80'	DRAWING NO.	FIGURE	REV.
JOB			3	

NOTES

1. COORDINATES SHOWN ARE ON THE J.H. CAMPBELL LOCAL PLANT DATUM
2. ELEVATIONS SHOWN ARE ON THE J.H. CAMPBELL LOCAL PLANT DATUM (NGVD 29).
3. EXCAVATED CONTOURS SHOWN FOR POND 3 NORTH ARE FROM THE APRIL 17, 2017 THROUGH THE MAY 3, 2017 SURVEYS. EXCAVATED CONTOURS SHOWN FOR POND 3 SOUTH ARE FROM THE POST-EXCAVATION SURVEY DATA PROVIDED BY RYAN INCORPORATED CENTRAL ON NOVEMBER 12, 2018.

LEGEND

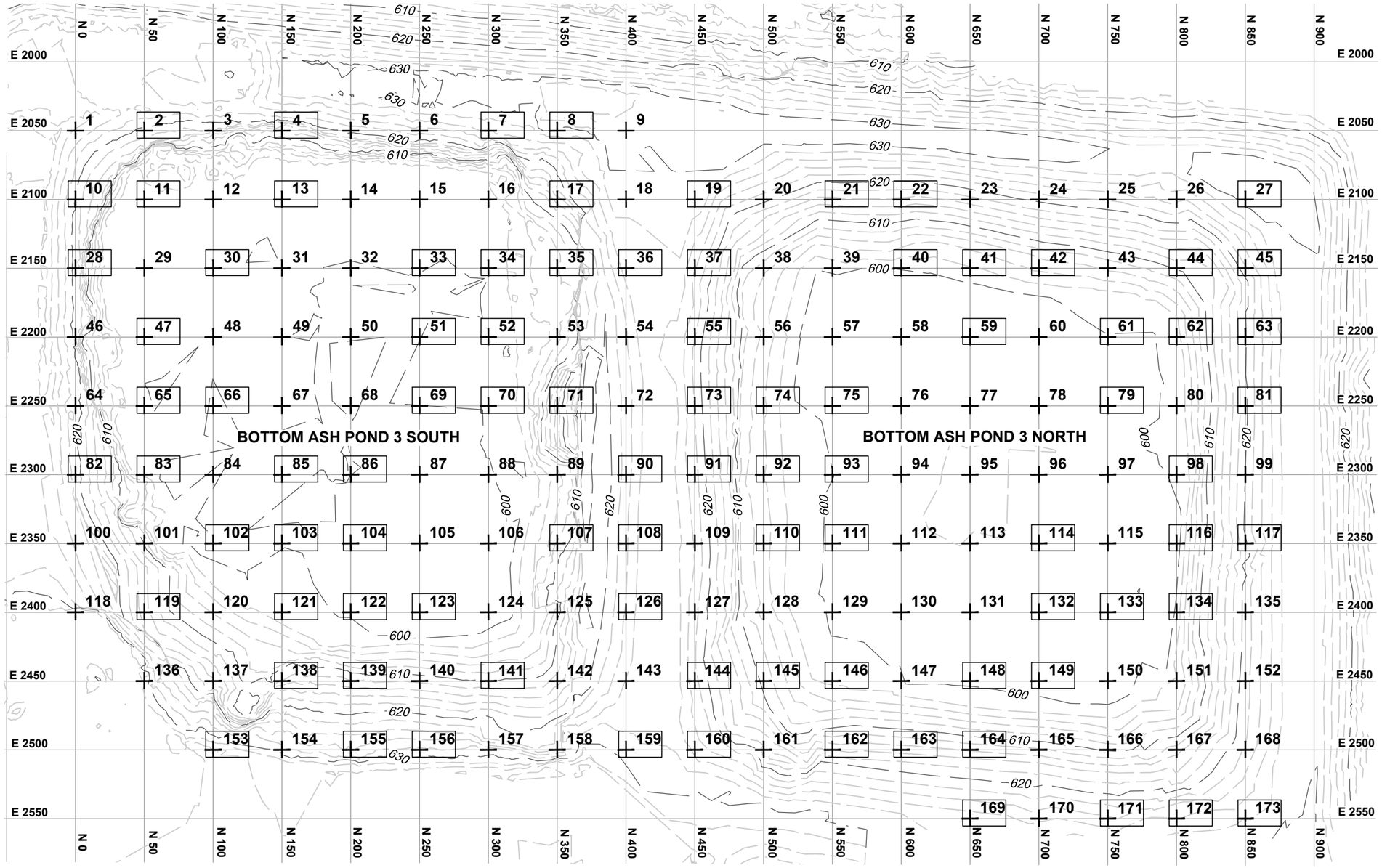
MAJOR CONTOUR (5 FT INTERVAL)

MINOR CONTOUR (1 FT INTERVAL)

2016 SOIL BORING LOCATION

GRID NODE 22

PHOTOGRAPHED GRID NODE 22



REV	DATE	DESCRIPTION	BY	CHK	APP
	03-13-19	ISSUED FOR FINAL REPORT	MAS	HAD	MAB
	12-10-18	ISSUED FOR DRAFT REPORT	MAS	HAD	MAB

SIGNATURE

NAME

MICHIGAN P.E. NO.

Consumers Energy

J.H. CAMPBELL ASH STORAGE FACILITY

JH CAMPBELL BOTTOM ASH POND 3 N/S

CCR REMOVAL DOCUMENTATION - PHOTOGRAPHED GRID NODES

SCALE	1" = 80'	DRAWING NO.	FIGURE	REV.
JOB			4	

NOTES

1. COORDINATES SHOWN ARE ON THE J.H. CAMPBELL LOCAL PLANT DATUM
2. ELEVATIONS SHOWN ARE ON THE J.H. CAMPBELL LOCAL PLANT DATUM (NGVD 29).
3. EXCAVATED CONTOURS SHOWN FOR POND 3 NORTH ARE FROM THE APRIL 17, 2017 THROUGH THE MAY 3, 2017 SURVEYS. EXCAVATED CONTOURS SHOWN FOR POND 3 SOUTH ARE FROM THE POST-EXCAVATION SURVEY DATA PROVIDED BY RYAN INCORPORATED CENTRAL ON NOVEMBER 12, 2018.

LEGEND

MAJOR CONTOUR (5 FT INTERVAL)

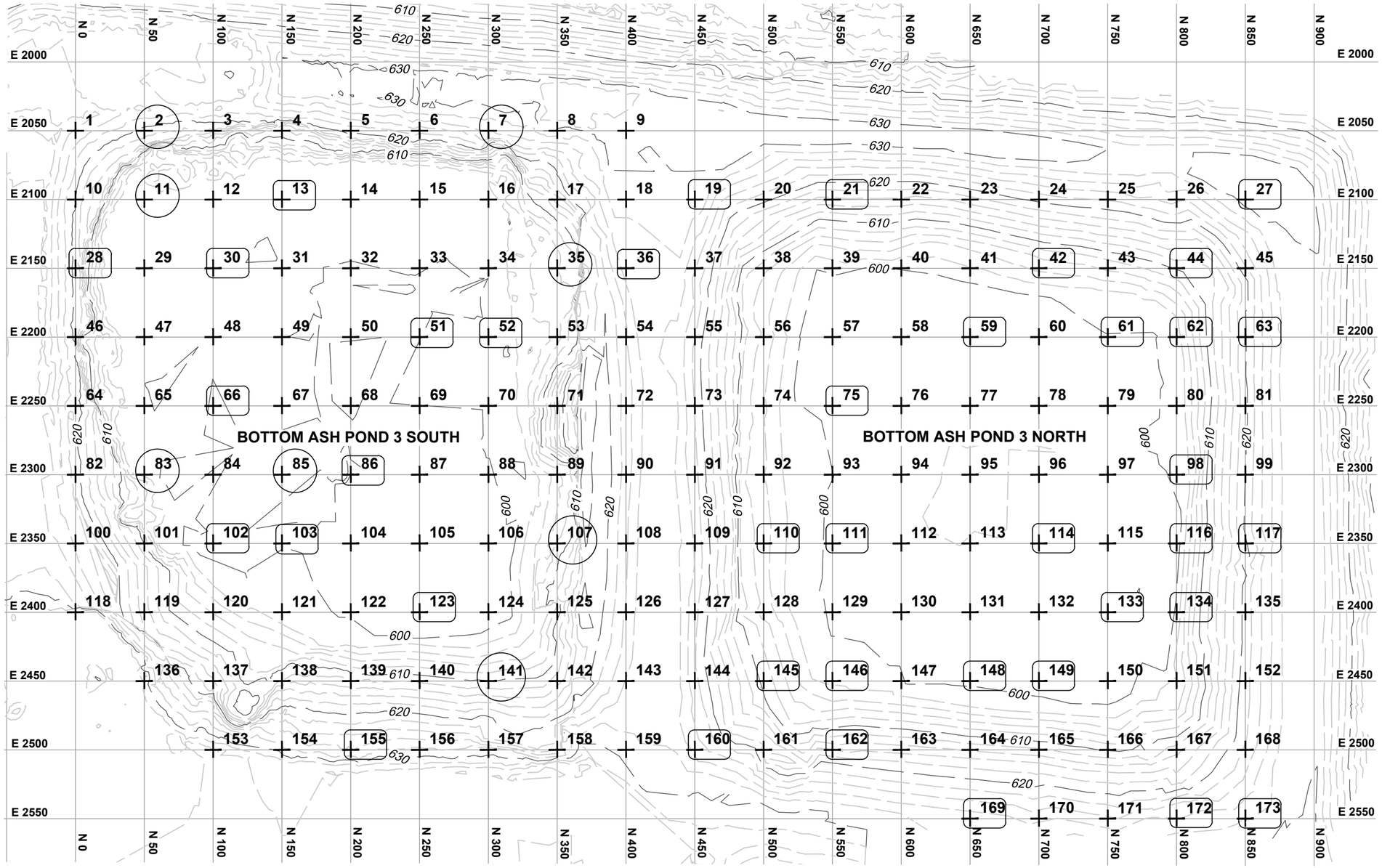
MINOR CONTOUR (1 FT INTERVAL)

2016 SOIL BORING LOCATION

GRID NODE 22

COLORIMETER APPROVED GRID NODE 22

MICROSCOPY APPROVED GRID NODE 22



REV	DATE	DESCRIPTION	BY	CHK	APP
	04-15-19	ISSUED FOR FINAL REPORT	DJS	JRP	MAB
	12-10-18	ISSUED FOR DRAFT REPORT	MAS	HAD	MAB

SIGNATURE

NAME

MICHIGAN P.E. NO.

Consumers Energy

J.H. CAMPBELL ASH STORAGE FACILITY

JH CAMPBELL BOTTOM ASH POND 3 N/S

CCR REMOVAL DOCUMENTATION -

COLORIMETER/MICROSCOPY CONFIRMATION GRID NODES

SCALE	1" = 80'	DRAWING NO.	FIGURE	REV.
JOB			5	

APPENDIX A

Subsurface Investigation Data

RECORD OF BOREHOLE JHC-BH-16001

SHEET 1 of 1

PROJECT: JH Campbell Ash Ponds
PROJECT NUMBER: 1654923
LOCATION: Unit 3 N Pond
CLIENT: Consumers

DRILLING METHOD: Sonic
DRILLING DATE: 5-18-16
DRILL RIG: Sonic

DATUM: NGVD29
AZIMUTH: ---
COORDS: N: 679, E: 2,210

GS ELEVATION (ft): 603.7
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 - 2.0 (SP) SAND, poorly graded, fine to medium, trace fine gravel, light brown, non-cohesive, wet, loose.	SP		601.7			1	SONIC		●		
		2.0 - 5.0 (CCR) COAL COMBUSTION RESIDUALS, some slag, dark gray, wet, soft.			2.0 598.7	1	4.50 5.00	2 3	SONIC SONIC		● ●	●	
5		5.0 - 15.0 (SP) SAND, poorly graded, fine, trace fine gravel, light brown, non-cohesive, wet, loose to compact.	SP		5.0	2 3	4.00 5.00 4.30 5.00	4	SONIC		●		Trace CCR within 5 feet of CCR/soil contact
10													
15		Boring completed at 15.0 ft.			588.7								
20													
25													
30													
35													
40													

NOTES:
1. Coordinates provided in plant datum.

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

LOGGED: DAF
CHECKED: JRP
DATE: 4/9/2019

Golder Associates

DUL_BOREHOLE (BC ASH POND) JH CAMPBELL POND 3 BORINGS.GPJ DUL.GOLDER.GDT 4/11/19

RECORD OF BOREHOLE JHC-BH-16002

SHEET 1 of 1

PROJECT: JH Campbell Ash Ponds
PROJECT NUMBER: 1654923
LOCATION: Unit 3 N Pond
CLIENT: Consumers

DRILLING METHOD: Sonic
DRILLING DATE: 5-18-16
DRILL RIG: Sonic

DATUM: NGVD29
AZIMUTH: ---
COORDS: N: 596, E: 2,386

GS ELEVATION (ft): 605.1
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	Sonic	0.0 - 2.0 (SP) SAND, poorly graded, fine to medium, light brown, non-cohesive, wet, loose.	SP		603.1			1	SONIC		●		
		2.0 - 5.0 (CCR) COAL COMBUSTION RESIDUALS, some slag and unburnt coal, some sand, dark gray to black, wet, soft.			2.0	1	4.50 5.00	2	SONIC		●		
					600.1			3	SONIC		●		
5		5.0 - 15.0 (SP) SAND, poorly graded, fine, trace fine gravel, light brown, non-cohesive, wet, loose to compact.			5.0			4	SONIC		●	●	
						2	3.80 5.00						
10			SP										
						3	4.50 5.00						
15					590.1								
		Boring completed at 15.0 ft.											
		NOTES: 1. Coordinates provided in plant datum.											
20													
25													
30													
35													
40													

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

LOGGED: DAF
CHECKED: JRP
DATE: 4/9/2019

Golder Associates

DUL_BOREHOLE (BC ASH POND) JH CAMPBELL POND 3 BORINGS.GPJ DUL.GOLDER.GDT 4/11/19

RECORD OF BOREHOLE JHC-BH-16003

SHEET 1 of 1

PROJECT: JH Campbell Ash Ponds
PROJECT NUMBER: 1654923
LOCATION: Unit 3 S Pond
CLIENT: Consumers

DRILLING METHOD: Sonic
DRILLING DATE: 5-17-16
DRILL RIG: Sonic

DATUM: NGVD29
AZIMUTH: ---
COORDS: N: 233, E: 2,260

GS ELEVATION (ft): 604.2
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 - 2.5 (SP) SAND, poorly graded, fine to medium, trace to some fine gravel, light brown, non-cohesive, wet, loose.	SP		601.7	1	4.50 5.00	1	SONIC		●		
		2.5 - 5.0 (CCR) COAL COMBUSTION RESIDUALS, some slag, dark gray, wet, soft.			2.5 599.2			2 3	SONIC SONIC		● ●	●	
5		5.0 - 17.0 (SP) SAND, poorly graded, fine, trace fine gravel, light brown, non-cohesive, wet, loose to compact.	SP		5.0	2	1.90 2.00	4	SONIC		●		Trace CCR within 1 foot of CCR/soil contact
10						3	4.50 5.00	5	SONIC		●		
15						4	4.80 5.00						
					587.2								
		Boring completed at 17.0 ft.											
20		NOTES: 1. Coordinates provided in plant datum.											
25													
30													
35													
40													

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

LOGGED: DAF
CHECKED: JRP
DATE: 4/9/2019

Golder Associates

DUL_BOREHOLE (BC ASH POND) JH CAMPBELL POND 3 BORINGS.GPJ DUL.GOLDER.GDT 4/11/19

RECORD OF BOREHOLE JHC-BH-16004

SHEET 1 of 1

PROJECT: JH Campbell Ash Ponds
PROJECT NUMBER: 1654923
LOCATION: Unit 3 S Pond
CLIENT: Consumers

DRILLING METHOD: Sonic
DRILLING DATE: 5-17-16
DRILL RIG: Sonic

DATUM: NGVD29
AZIMUTH: ---
COORDS: N: 233, E: 2,386

GS ELEVATION (ft): 606.6
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 - 2.8 (SP) SAND, poorly graded, fine to medium, some fine gravel, light brown, non-cohesive, wet, loose.	SP		603.9	1	4.80 5.00	1	SONIC		●		
		2.8 - 5.0 (CCR) COAL COMBUSTION RESIDUALS, trace slag and fine gravel, dark gray, wet, soft.		△ △ △ ▷ △ ▷ △ ▷ △	2.8 601.6			2	SONIC		●		
5								3	SONIC		●		
		5.0 - 17.0 (SP) SAND, poorly graded, fine, trace fine gravel, light brown, non-cohesive, wet, loose to compact.			5.0	2	4.50 5.00	4	SONIC		●	●	Trace to some CCR within 3 feet of CCR/soil contact
10			SP			3	4.00 5.00						
15						4	1.80 2.00						
					589.6								
20		Boring completed at 17.0 ft.											
		NOTES: 1. Coordinates provided in plant datum.											
25													
30													
35													
40													

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

LOGGED: DAF
CHECKED: JRP
DATE: 4/9/2019

Golder Associates

DUL_BOREHOLE (BC ASH POND) JH CAMPBELL POND 3 BORINGS.GPJ DUL.GOLDER.GDT 4/11/19

RECORD OF BOREHOLE JHC-BH-16011

SHEET 1 of 1

PROJECT: JH Campbell Ash Ponds
PROJECT NUMBER: 1654923
LOCATION: Unit 3 N Pond
CLIENT: Consumers

DRILLING METHOD: Hand Auger
DRILLING DATE: 6-24-16
DRILL RIG: NA

DATUM: NGVD29
AZIMUTH: ---
COORDS: N: 785, E: 2,182

GS ELEVATION (ft): 607.6
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	Hand Auger	0.0 - 5.5 (CCR) COAL COMBUSTION RESIDUALS, black, moist to wet.											
5		5.5 - 6.0 (SP) SAND, poorly graded, brown, wet.	SP		602.1 601.6			1 2			● ●		
		Boring completed at 6.0 ft.											

NOTES:
1. Coordinates provided in plant datum.

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

LOGGED: AK
CHECKED: JRP
DATE: 4/9/2019

Golder Associates

DUL_BOREHOLE (BC ASH POND) JH CAMPBELL POND 3 BORINGS.GPJ DUL.GOLDER.GDT 4/11/19

RECORD OF BOREHOLE JHC-BH-16012

SHEET 1 of 1

PROJECT: JH Campbell Ash Ponds
PROJECT NUMBER: 1654923
LOCATION: Unit 3 N Pond
CLIENT: Consumers

DRILLING METHOD: Hand Auger
DRILLING DATE: 6-24-16
DRILL RIG: NA

DATUM: NGVD29
AZIMUTH: ---
COORDS: N: 695, E: 2,458

GS ELEVATION (ft): 604.6
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	Hand Auger	0.0 - 4.0 (CCR) COAL COMBUSTION RESIDUALS, black, moist to wet.			600.6			1			●		
		4.0 - 4.5 (SP) SAND, poorly graded, fine to medium, brown, wet.	SP		600.1			2			●		
5		Boring completed at 4.5 ft.											
10		NOTES: 1. Coordinates provided in plant datum.											
15													
20													
25													
30													
35													
40													

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

LOGGED: AK
CHECKED: JRP
DATE: 4/9/2019

Golder Associates

DUL_BOREHOLE (BC ASH POND) JH CAMPBELL POND 3 BORINGS.GPJ DUL.GOLDER.GDT 4/11/19

RECORD OF BOREHOLE JHC-BH-16013

SHEET 1 of 1

PROJECT: JH Campbell Ash Ponds
PROJECT NUMBER: 1654923
LOCATION: Unit 3 N Pond
CLIENT: Consumers

DRILLING METHOD: Hand Auger
DRILLING DATE: 6-24-16
DRILL RIG: NA

DATUM: NGVD29
AZIMUTH: ---
COORDS: N: 520, E: 2,250

GS ELEVATION (ft): 605.5
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	Hand Auger	0.0 - 4.0 (CCR) COAL COMBUSTION RESIDUALS, black, moist to wet.			601.5								
		4.0 - 4.5 (SP) SAND, poorly graded, fine to medium, brown, wet.	SP		601.0			2			●		
5		Boring completed at 4.5 ft.											

NOTES:
1. Coordinates provided in plant datum.

10 15 20 25 30 35 40

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

LOGGED: AK
CHECKED: JRP
DATE: 4/9/2019

Golder Associates

DUL_BOREHOLE (BC ASH POND) JH CAMPBELL POND 3 BORINGS.GPJ DUL.GOLDER.GDT 4/11/19

RECORD OF BOREHOLE JHC-BH-16014

SHEET 1 of 1

PROJECT: JH Campbell Ash Ponds
PROJECT NUMBER: 1654923
LOCATION: Unit 3 S Pond
CLIENT: Consumers

DRILLING METHOD: Hand Auger
DRILLING DATE: 6-24-16
DRILL RIG: NA

DATUM: NGVD29
AZIMUTH: ---
COORDS: N: 306, E: 2,334

GS ELEVATION (ft): 604.7
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	Hand Auger	0.0 - 2.0 (CCR) COAL COMBUSTION RESIDUALS, black, moist to wet.			602.7			1			●		
		2.0 - 3.0 (SP) SAND, poorly graded, fine to medium, brown, wet.	SP		2.0 601.7			2			●		
		Boring completed at 3.0 ft.											
5		NOTES: 1. Coordinates provided in plant datum.											
10													
15													
20													
25													
30													
35													
40													

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

LOGGED: AK
CHECKED: JRP
DATE: 4/9/2019

Golder Associates

DUL_BOREHOLE (BC ASH POND) JH CAMPBELL POND 3 BORINGS.GPJ DUL.GOLDER.GDT 4/11/19

RECORD OF BOREHOLE JHC-BH-16015

SHEET 1 of 1

PROJECT: JH Campbell Ash Ponds
PROJECT NUMBER: 1654923
LOCATION: Unit 3 S Pond
CLIENT: Consumers

DRILLING METHOD: Hand Auger
DRILLING DATE: 6-24-16
DRILL RIG: NA

DATUM: NGVD29
AZIMUTH: ---
COORDS: N: 98, E: 2,140

GS ELEVATION (ft): 603.5
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	Hand Auger	0.0 - 2.5 (CCR) COAL COMBUSTION RESIDUALS, black, wet.			601.0								
		2.5 - 3.0 (SP) SAND, poorly graded, fine to medium, brown, wet.	SP		600.5			2			●		
		Boring completed at 3.0 ft.											
5		NOTES: 1. Coordinates provided in plant datum.											
10													
15													
20													
25													
30													
35													
40													

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

LOGGED: AK
CHECKED: JRP
DATE: 4/9/2019

Golder Associates

DUL_BOREHOLE (BC ASH POND) JH CAMPBELL POND 3 BORINGS.GPJ DUL.GOLDER.GDT 4/11/19

RECORD OF BOREHOLE JHC-BH-16016

SHEET 1 of 1

PROJECT: JH Campbell Ash Ponds
PROJECT NUMBER: 1654923
LOCATION: Unit 3 S Pond
CLIENT: Consumers

DRILLING METHOD: Hand Auger
DRILLING DATE: 6-24-16
DRILL RIG: NA

DATUM: NGVD29
AZIMUTH: ---
COORDS: N: 98, E: 2,229

GS ELEVATION (ft): 604.7
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	Hand Auger	0.0 - 2.0 (CCR) COAL COMBUSTION RESIDUALS, black, moist to wet.			602.7			1			●		
		Boring completed at 2.0 ft.											

NOTES:
1. Coordinates provided in plant datum.

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

LOGGED: AK
CHECKED: JRP
DATE: 4/9/2019

Golder Associates

DUL_BOREHOLE (BC ASH POND) JH CAMPBELL POND 3 BORINGS.GPJ DUL.GOLDER.GDT 4/11/19

Engineering & Environmental Solutions, LLC

400 136th Avenue
Building 100, Suite B
Holland, Michigan 49424
Phone/Fax: (616) 994-6541
www.goEESolutions.com

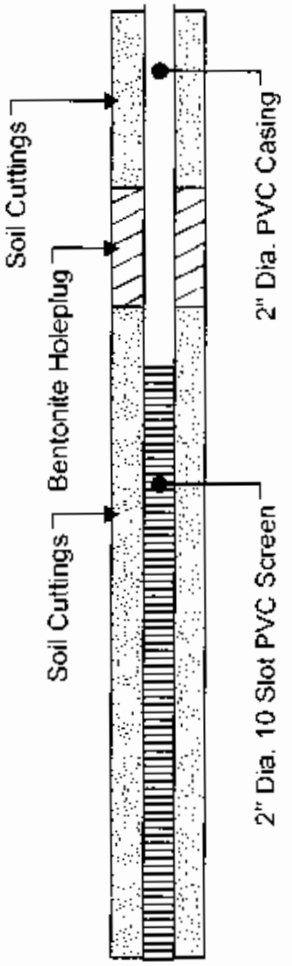
Project Name: Consumers Unit 3 Pond Berm
Project Number: 005-16-012
Site Location: JH Campbell
Drilling Method: 8.25" OD HSA
Sampling Method: 2' Split Spoon
Ground Elevation (feet): 631.93
Top of Casing Elevation (feet): 635.39
Logged By: Kurt Van Appledorn
Comments: 3.5' Stickup with J-plug cap

Log of Borehole: Pond 3B-1

Start Date: 9-14-2016
End Date: 9-14-2016
Driller: Mateco
Crew Chief: Gary
Depth to Water (ft BGS during drilling): 19
Easting: 12633808.36
Northing: 519651.999

Depth (feet BGS)	Symbol	Description	Elevation (feet above msl)	Sample Length (feet)	Recovery (feet)	Blow Counts
		Ground Surface	631.9			
0-7		0-7.0' Brownish gray sandy ASH, little coarse black cinders		2	1.6	3 3 3 3
				2	2.0	2 2 1 2
			624.9			
7-21		7.0-21' Brown fine SAND, occassional seams of dark brown silty sand		2	1.5	5 7 9 10
				2	1.8	13 13 16 17
				2	1.5	5 7 10 11
			610.9			
21-28		21-28' Dark brown silty fine SAND, trace gravel, wet		2	1.8	12 15 19 22
			603.9			
28-32		28-28.2' Fine to coarse SAND, wet 28.2-28.5' WOOD 28.5-32.0' Brown fine SAND, wet		2	2.0	7 7 8 10
			599.9			
32		End of Boring				

Well Completion Details



Engineering & Environmental Solutions, LLC

400 136th Avenue
Building 100, Suite B
Holland, Michigan 49424
Phone/Fax: (616) 994-6541
www.goEESolutions.com

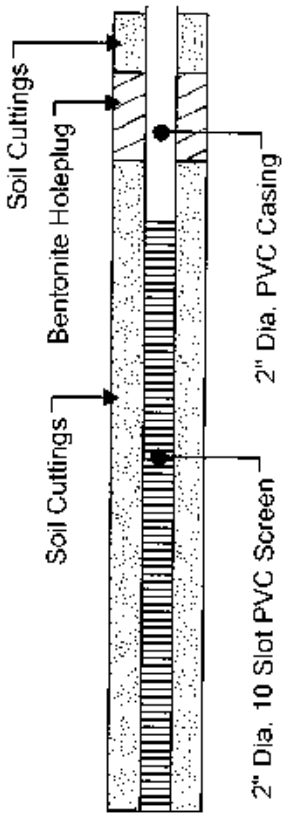
Project Name: Consumers Unit 3 Pond Berm
Project Number: 005-16-012
Site Location: JH Campbell
Drilling Method: 8.25" OD HSA
Sampling Method: 2' Split Spoon
Ground Elevation (feet): 632.16
Top of Casing Elevation (feet): 635.17
Logged By: Kurt Van Appledorn
Comments: 3' Stickup with J-plug cap

Log of Borehole: Pond 3B-2

Start Date: 9-15-2016
End Date: 9-15-2016
Driller: Mateco
Crew Chief: Gary
Depth to Water (ft BGS during drilling): 17.5
Easting: 12633809.6
Northing: 519680.63

Depth (feet BGS)	Symbol	Description	Elevation (feet above msl)	Sample Length (feet)	Recovery (feet)	Blow Counts
		SUBSURFACE PROFILE		**SAMPLE**		
0		Ground Surface	632.2			
1		0-1.2' Black and brown sandy ASH, trace cinders	631.0	2	1.5	2 2 3 3
2		1.2-21.4' Brown fine SAND				
3						
4				2	1.2	5 5 6 8
5						
6						
7				2	1.8	6 9 11 13
8						
9				2	1.6	6 8 11 11
10						
11		Occassional thin dark brown silty sand seams between 11 and 12.5'				
12				2	1.6	6 9 13 17
13						
14				2	1.7	6 9 9 10
15		1" dark brown silty sand seam at 16.4'				
16		wet at ~17.5'				
17				2	1.8	5 8 14 19
18						
19		1" dark brown silty fine seam with trace organics at 21.3'		2	1.7	6 9 12 14
20						
21			610.6			
22		21.4-22.4' Brown very fine SAND, wet	609.6	2	2.0	6 13 21 30
23		22.4-27.0' Grayish dark brown silty fine SAND, less silt but still silty below 23', trace organics, wet.				
24				2	1.9	9 20 31 33
25						
26		Grayish color similar to ash, but sand grains appear natural.	605.2	2	2.0	5 6 13 15
27						
28		End of Boring				
29						
30						
31						
32						
33						
34						
35						
36						
37						
38						
39						

Well Completion Details



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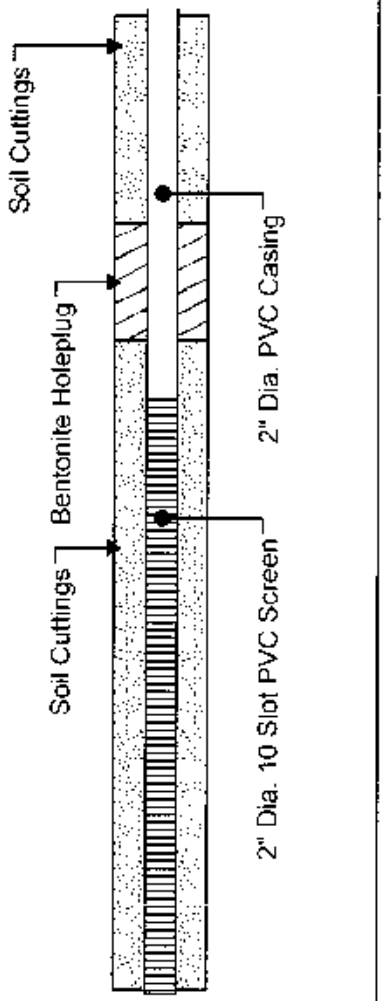
Project Name: Consumers Unit 3 Pond Berm
Project Number: 005-16-012
Site Location: JH Campbell
Drilling Method: 8.25" OD HSA
Sampling Method: 2' Split Spoon
Ground Elevation (feet): 633.29
Top of Casing Elevation (feet): 636.33
Logged By: Kurt Van Appledorn
Comments: 3.3' Stickup with J-plug cap

Log of Borehole: Pond 3B-3

Start Date: 9-14-2016
End Date: 9-14-2016
Driller: Mateco
Crew Chief: Gary
Depth to Water (ft BGS during drilling): 22.5
Easting: 12633963.25
Northing: 519641.61

Depth (feet BGS)	Symbol	Description	Elevation (feet above msl)	Sample Length (feet)	Recovery (feet)	Blow Counts
		Ground Surface	633.3			
0-8		0-8.0' Brown and gray fine sandy ASH, little cinders		2	1.5	5 7 7 7
				2	1.3	2 2 2 2
			625.3	2	1.3	2 2 1 2
8-13		8.0-13' Brown fine SAND		2	1.8	2 2 2 2
			620.3	2	1.2	4 6 7 16
13-14		13.0-13.6' Clayey fine SAND		2	1.8	11 11 13 16
14-15		13.6-14.2' Sandy CLAY				
14.2-28.7		14.2-28.7' Brown fine SAND		2	1.7	9 17 14 19
19-20		Layers of dark brown silty fine sand at 19.4-20'		2	1.7	9 12 17 18
22-23		Wet at 22.5'		2	1.6	6 11 13 16
24-25				2	1.9	10 13 16 22
			604.6			
28.7-33.0		28.7-33.0' Brown to dark brown silty fine SAND, 2" wood at 29.3', wet		2	2.0	8 11 16 16
			600.3	2	0.6	5 7 10 11
		End of Boring				



Well Completion Details

Engineering & Environmental Solutions, LLC

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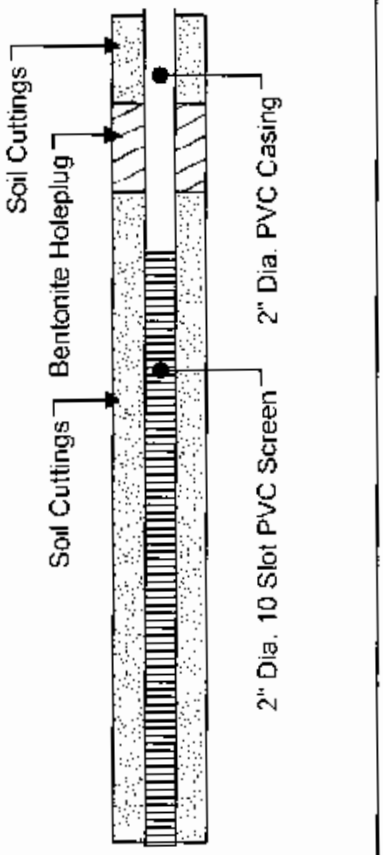
Project Name: Consumers Unit 3 Pond Berm
Project Number: 005-16-012
Site Location: JH Campbell
Drilling Method: 8.25" OD HSA
Sampling Method: 2' Split Spoon
Ground Elevation (feet): 632.81
Top of Casing Elevation (feet): 634.72
Logged By: Kurt Van Appledorn
Comments: 1.9' Stickup with J-plug cap

Log of Borehole: Pond 3B-4

Start Date: 9-14-2016
End Date: 9-14-2016
Driller: Mateco
Crew Chief: Gary
Depth to Water (ft BGS during drilling): 19
Easting: 12633865.97
Northing: 519671.53

SUBSURFACE PROFILE				SAMPLE			
Depth (feet BGS)	Symbol	Description	Elevation (feet above msl)	Sample Length (feet)	Recovery (feet)	Blow Counts	Well Completion Details
		Ground Surface	632.8				
0		0-0.8' Black sandy ASH, some coarse cinders	632.0	2	1.0	5 8 8 8	
1-12		0.8-13.0' Brown fine SAND Dark brown fine sand ash at 3-3.5' Dark brown find sandy ash with trace black cinders at 8.2-9.0'		2 2 2	1.7 2.0	6 5 7 10 5 7 18 19	
13		13.0-13.5' Dark brown to gray sandy ASH, trace cinders	619.8	2	2.0	8 17 22 22	
14-18		13.5-18.6' Dark brown silty fine SAND (natural), trace gravel and organics, some 1" brown fine sand layers.	614.2				
19-27		18.6-28.0' Brown fine SAND Wet at 19' 3-4" seams of brown silty sand between 23 and 25' silty sand below 26' with 1" wood at 27'	604.8	2 2 2	2.0 2.0 1.9	8 12 17 20 6 8 11 17 3 6 11 16	
28		End of Boring					



RECORD OF TEST PIT TP 3075

SHEET 1 of 1

PROJECT: JH Campbell Ash Ponds
PROJECT NUMBER: 177605
LOCATION: Unit 3 N Pond
CLIENT: Consumers

EXCAVATION DATE: 4-25-17
EQUIPMENT: Backhoe

DATUM: NGVD29
COORDS: N: 461.00 E: 2,216.00

GS ELEVATION (ft): 621

DEPTH (ft)	SOIL PROFILE: DESCRIPTION / VEGETATION:	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	SAMPLES: TYPE	NOTES AND REMARKS	WATER CONTENT (PERCENT) W_p W W_l (10 20 30 40)	NOTES WATER LEVELS
0	0.0 - 8.0 (SP) SAND, poorly graded, fine grained, trace CCR, brown, non-cohesive, moist.	SP					Field microscopy estimated <5% CCR present		
5					3075	GRAB	Silt and clay lenses; Lab microscopy estimated 2.6% CCR present		
				613.0					
	Boring completed at 8.0 ft.								
10	NOTES: 1. Coordinates provided in plant datum.								
15									
20									
25									
30									
35									
40									

DEPTH SCALE:1 in to 5 ft
DRILLING CONTRACTOR: Ryan Central

LOGGED: APW
CHECKED: JRP
DATE: 4/9/2019

Golder Associates

Figure
TP 3075

DUL_TESTPIT JH CAMPBELL POND 3 TEST PITS.GPJ GLDR_ANC.GDT 4/10/19

RECORD OF TEST PIT TP 3076

SHEET 1 of 1

PROJECT: JH Campbell Ash Ponds
PROJECT NUMBER: 177605
LOCATION: Unit 3 N Pond
CLIENT: Consumers

EXCAVATION DATE: 4-25-17
EQUIPMENT: Backhoe

DATUM: NGVD29
COORDS: N: 468.00 E: 2,171.00

GS ELEVATION (ft): 625

DEPTH (ft)	SOIL PROFILE: DESCRIPTION / VEGETATION:	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	SAMPLES: TYPE	NOTES AND REMARKS	WATER CONTENT (PERCENT) W_P W W_l 10 20 30 40	NOTES WATER LEVELS
0	0.0 - 11.0 (SP) SAND, poorly graded, fine grained, trace CCR, brown, non-cohesive, moist.	SP					Field microscopy estimated 2-3% CCR present		
5									
10					3076	GRAB	Silt and clay lenses; Lab microscopy estimated <0.9% CCR present		
				614.0					
	Boring completed at 11.0 ft.								
15	NOTES: 1. Coordinates provided in plant datum.								
20									
25									
30									
35									
40									

DEPTH SCALE:1 in to 5 ft
DRILLING CONTRACTOR: Ryan Central

LOGGED: APW
CHECKED: JRP
DATE: 4/9/2019

Golder Associates

Figure
TP 3076

DUL_TESTPIT JH CAMPBELL POND 3 TEST PITS.GPJ GLDR_ANC.GDT 4/10/19

PROJECT: JH Campbell Ash Ponds
PROJECT NUMBER: 177605
LOCATION: Unit 3 N Pond
CLIENT: Consumers

RECORD OF TEST PIT TP 3077

SHEET 1 of 1

EXCAVATION DATE: 4-25-17
EQUIPMENT: Backhoe

DATUM: NGVD29
COORDS: N: 474.00 E: 2,396.00

GS ELEVATION (ft): 623

DEPTH (ft)	SOIL PROFILE: DESCRIPTION / VEGETATION:	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	SAMPLES: TYPE	NOTES AND REMARKS	WATER CONTENT (PERCENT) W_P W W_l (10 20 30 40)	NOTES WATER LEVELS
0	0.0 - 10.0 (SP) SAND, poorly graded, fine grained, trace CCR, brown, non-cohesive, moist.	SP			3077	GRAB	Field microscopy estimated 3.5% CCR present Silty sand lenses with some organics, gravel, and bitumenous asphalt; Lab microscopy estimated 3.8% CCR present		
5									
10				613.0					
	Boring completed at 10.0 ft.								

NOTES:
1. Coordinates provided in plant datum.

DEPTH SCALE:1 in to 5 ft
DRILLING CONTRACTOR: Ryan Central

LOGGED: APW
CHECKED: JRP
DATE: 4/9/2019

Golder Associates

Figure
TP 3077

DUL_TESTPIT JH CAMPBELL POND 3 TEST PITS.GPJ GLDR_ANC.GDT 4/10/19

RECORD OF TEST PIT TP 3078

SHEET 1 of 1

PROJECT: JH Campbell Ash Ponds
PROJECT NUMBER: 177605
LOCATION: Unit 3 N Pond
CLIENT: Consumers

EXCAVATION DATE: 4-25-17
EQUIPMENT: Backhoe

DATUM: NGVD29
COORDS: N: 467.00 E: 2,462.00

GS ELEVATION (ft): 626

DEPTH (ft)	SOIL PROFILE: DESCRIPTION / VEGETATION:	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	SAMPLES: TYPE	NOTES AND REMARKS	WATER CONTENT (PERCENT) W_p W W_l (10 20 30 40)	NOTES WATER LEVELS
0	0.0 - 10.0 (SP) SAND, poorly graded, fine grained, trace CCR, brown, non-cohesive, moist.	SP					Field microscopy estimated 1-2% CCR present		
5									
					3078	GRAB	Sand with clay lenses; Lab microscopy estimated 2.3% CCR present		
10	Boring completed at 10.0 ft.			616.0					
15	NOTES: 1. Coordinates provided in plant datum.								
20									
25									
30									
35									
40									

DEPTH SCALE:1 in to 5 ft
DRILLING CONTRACTOR: Ryan Central

LOGGED: APW
CHECKED: JRP
DATE: 4/9/2019

Golder Associates

Figure
TP 3078

DUL_TESTPIT JH CAMPBELL POND 3 TEST PITS.GPJ GLDR_ANC.GDT 4/10/19

RECORD OF TEST PIT TP-1

SHEET 1 of 1

PROJECT: JH Campbell Ash Ponds
PROJECT NUMBER: 1896102
LOCATION: Unit 3 S Pond
CLIENT: Consumers

EXCAVATION DATE: 10-4-18
EQUIPMENT: CAT 326F Excavator

DATUM: NGVD29
COORDS: N: -12.63 E: 2,197.84

GS ELEVATION (ft): 627.2

DEPTH (ft)	SOIL PROFILE: DESCRIPTION / VEGETATION:	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	SAMPLES: TYPE	NOTES AND REMARKS	WATER CONTENT (PERCENT) W_p W W_l (10 20 30 40)	NOTES WATER LEVELS
0	0.0 - 1.5 (SP) SAND, poorly graded, fine to medium grained, light brown, non-cohesive.	SP		625.7					
	1.5 - 7.0 (SM) SILTY SAND with black organics, poorly graded, fine to medium grained, dark brown to gray, non-cohesive.	SM		1.5 620.2					
	7.0 - 8.0 (SP) SAND, poorly graded, fine to medium grained, light brown, non-cohesive.	SP		7.0 619.2					
	Boring completed at 8.0 ft.								

NOTES:
1. Coordinates provided in plant datum.

DEPTH SCALE:1 in to 5 ft
DRILLING CONTRACTOR: Ryan Central

LOGGED: HAD
CHECKED: JRP
DATE: 4/9/2019

Golder Associates

Figure TP-1

DUL_TESTPIT_JH CAMPBELL POND 3 TEST PITS.GPJ GLDR_ANC.GDT 4/10/19

PROJECT: JH Campbell Ash Ponds
PROJECT NUMBER: 1896102
LOCATION: Unit 3 S Pond
CLIENT: Consumers

RECORD OF TEST PIT TP-2

SHEET 1 of 1

EXCAVATION DATE: 10-4-18
EQUIPMENT: CAT 326F Excavator

DATUM: NGVD29
COORDS: N: 2.06 E: 2,069.16

GS ELEVATION (ft): 624.7

DEPTH (ft)	SOIL PROFILE: DESCRIPTION / VEGETATION:	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	SAMPLES: TYPE	NOTES AND REMARKS	WATER CONTENT (PERCENT) W_p W W_l (10 20 30 40)	NOTES WATER LEVELS
0	0.0 - 6.0 (SP) SAND with silt and black organics, poorly graded, fine to medium grained, light brown, non-cohesive.	SP		618.7					
5	6.0 - 9.0 (SM) SILTY SAND with black organics, poorly graded, fine to medium grained, dark brown to gray, non-cohesive.	SM		6.0 615.7					
10	9.0 - 10.0 (SP) SAND, poorly graded, fine to medium grained, light brown, non-cohesive.	SP		9.0 614.7					
	Boring completed at 10.0 ft.								

NOTES:
1. Coordinates provided in plant datum.

DEPTH SCALE:1 in to 5 ft
DRILLING CONTRACTOR: Ryan Central

LOGGED: HAD
CHECKED: JRP
DATE: 4/9/2019

Golder Associates

Figure TP-2

DUL_TESTPIT JH CAMPBELL POND 3 TEST PITS.GPJ GLDR_ANC.GDT 4/10/19

PROJECT: JH Campbell Ash Ponds
PROJECT NUMBER: 1896102
LOCATION: Unit 3 S Pond
CLIENT: Consumers

RECORD OF TEST PIT TP-3

SHEET 1 of 1

EXCAVATION DATE: 10-4-18
EQUIPMENT: CAT 326F Excavator

DATUM: NGVD29
COORDS: N: 121.63 E: 2,053.31

GS ELEVATION (ft): 619.7

DEPTH (ft)	SOIL PROFILE: DESCRIPTION / VEGETATION:	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	SAMPLES: TYPE	NOTES AND REMARKS	WATER CONTENT (PERCENT) W_p W W_l (10 20 30 40)	NOTES WATER LEVELS
0	0.0 - 1.0 (SM) SILTY SAND, poorly graded, fine to medium grained, dark brown, non-cohesive.	SM		618.7					
	1.0 - 2.0 (SP) SAND, poorly graded, fine to medium grained, light brown, non-cohesive.	SP		1.0 617.7					
	2.0 - 5.0 (SM) SILTY SAND, poorly graded, fine to medium grained, dark brown, non-cohesive.	SM		2.0 614.7					
5	5.0 - 7.5 (SM) SILTY SAND with gray silt, poorly graded, fine to medium grained, brown, non-cohesive.	SM		5.0 612.2					
	7.5 - 8.0 (SP) SAND, poorly graded, fine to medium grained, light brown, non-cohesive.	SP		611.7					
	Boring completed at 8.0 ft.								
10	NOTES: 1. Coordinates provided in plant datum.								
15									
20									
25									
30									
35									
40									

DUL_TESTPIT JH CAMPBELL POND 3 TEST PITS.GPJ GLDR_ANC.GDT 4/10/19

Golder Associates

DEPTH SCALE:1 in to 5 ft
DRILLING CONTRACTOR: Ryan Central

LOGGED: HAD
CHECKED: JRP
DATE: 4/9/2019

Figure TP-3

APPENDIX B

Bottom Ash Pond 3 N/S CCR Removal Photo Log

Project Title: Pond 3N/S Excavation Sequence Photographic Documentation Log	
PHOTO 1 Orientation: Looking northwest.	
PHOTO 2 Orientation: Looking northwest.	

Project Title: Pond 3N/S Excavation Sequence Photographic Documentation Log	
PHOTO 3 Orientation: Looking north.	
PHOTO 4 Orientation: Looking north.	

Project Title: Pond 3N/S Excavation Sequence Photographic Documentation Log	
PHOTO 5 Orientation: Looking north.	
PHOTO 6 Orientation: Looking north.	

Project Title: Pond 3N/S Excavation Sequence Photographic Documentation Log	
PHOTO 7 Orientation: Looking north.	
PHOTO 8 Orientation: Looking north.	

Project Title: Pond 3N/S Excavation Sequence Photographic Documentation Log	
PHOTO 9 Orientation: Looking north.	
PHOTO 10 Orientation: Looking north.	

Project Title: Pond 3N/S Excavation Sequence Photographic Documentation Log	
PHOTO 11 Orientation: Looking north.	
PHOTO 12 Orientation: Looking north.	

Project Title: Pond 3N/S Excavation Sequence Photographic Documentation Log	
PHOTO 13 Orientation: Looking north.	
PHOTO 14 Orientation: Looking north.	

Project Title: Pond 3N/S Excavation Sequence Photographic Documentation Log	
PHOTO 15 Orientation: Looking north.	
PHOTO 16 Orientation: Looking north.	

Project Title: Pond 3N/S Excavation Sequence Photographic Documentation Log	
PHOTO 17 Orientation: Looking north.	
PHOTO 18 Orientation: Looking north.	

Project Title: Pond 3N/S Excavation Sequence Photographic Documentation Log	
PHOTO 19 Orientation: Looking north.	
PHOTO 20 Orientation: Looking north.	

Project Title: Pond 3N/S Excavation Sequence Photographic Documentation Log	
PHOTO 21 Orientation: Looking north.	
PHOTO 22 Orientation: Looking north.	

Project Title: Pond 3N/S Excavation Sequence Photographic Documentation Log	
PHOTO 23 Orientation: Looking north.	
PHOTO 24 Orientation: Looking north.	

Project Title: Pond 3N/S Excavation Sequence Photographic Documentation Log	
PHOTO 25 Orientation: Looking north.	
PHOTO 26 Orientation: Looking north.	

Project Title: Pond 3N/S Excavation Sequence Photographic Documentation Log

PHOTO 27 Image captured by drone (5/3/2017).	
PHOTO 28 Date:6/6/2018 Orientation: Looking west.	

Project Title: Pond 3N/S Excavation Sequence Photographic Documentation Log	
PHOTO 29 Date:6/26/2018 Orientation: Looking west.	
PHOTO 30 Date:7/25/2018 Orientation: Looking west.	

Project Title: Pond 3N/S Excavation Sequence Photographic Documentation Log	
PHOTO 31 Date:8/22/2018 Orientation: Looking west.	
PHOTO 32 Date:9/17/2018 Orientation: Looking west.	

Project Title: Pond 3N/S Excavation Sequence Photographic Documentation Log	
PHOTO 33 Date:9/21/2018 Orientation: Looking west.	
PHOTO 34 Date:9/22/2018 Orientation: Looking southwest.	

Project Title: Pond 3N/S Excavation Sequence Photographic Documentation Log	
PHOTO 35 Date:9/24/2018 Orientation: Looking southwest.	
PHOTO 36 Date:9/25/2018 Orientation: Looking southwest.	

Project Title: Pond 3N/S Excavation Sequence Photographic Documentation Log

PHOTO 37 Date:9/26/2018 Orientation: Looking southwest.	
PHOTO 38 Date:9/27/2018 Orientation: Looking southwest.	

Project Title: Pond 3N/S Excavation Sequence Photographic Documentation Log	
PHOTO 39 Date:9/28/2018 Orientation: Looking southwest.	
PHOTO 40 Date:9/29/2018 Orientation: Looking southwest.	

Project Title: Pond 3N/S Excavation Sequence Photographic Documentation Log	
PHOTO 41 Date:10/2/2018 Orientation: Looking southwest.	
PHOTO 42 Date:10/3/2018 Orientation: Looking southwest.	

Project Title: Pond 3N/S Excavation Sequence Photographic Documentation Log	
PHOTO 43 Date:10/4/2018 Orientation: Looking northwest.	
PHOTO 44 Date:10/8/2018 Orientation: Looking west.	

Project Title: Pond 3N/S Excavation Sequence Photographic Documentation Log

PHOTO 45 Date:10/9/2018 Orientation: Looking southwest.	
PHOTO 46 Date:10/10/2018 Orientation: Looking west.	

Project Title: Pond 3N/S Excavation Sequence Photographic Documentation Log	
PHOTO 47 Date:10/11/2018 Orientation: Looking west.	
PHOTO 48 Date:10/12/2018 Orientation: Looking west.	

Project Title: Pond 3N/S Excavation Sequence Photographic Documentation Log	
PHOTO 49 Date:10/15/2018 Orientation: Looking west.	
PHOTO 50 Date:10/16/2018 Orientation: Looking west.	

Project Title: Pond 3N/S Excavation Sequence Photographic Documentation Log	
PHOTO 51 Date:10/17/2018 Orientation: Looking west.	
PHOTO 52 Date:10/18/2018 Orientation: Looking west.	

Project Title: Pond 3N/S Excavation Sequence Photographic Documentation Log	
PHOTO 53 Date:10/19/2018 Orientation: Looking northwest.	
PHOTO 54 Date:10/22/2018 Orientation: Looking west.	

Project Title: Pond 3N/S Excavation Sequence Photographic Documentation Log	
PHOTO 55 Date:10/23/2018 Orientation: Looking west.	
PHOTO 56 Date:10/24/2018 Orientation: Looking south.	

Project Title: Pond 3N/S Excavation Sequence Photographic Documentation Log	
PHOTO 57 Date:10/25/2018 Orientation: Looking west.	
PHOTO 58 Date:10/26/2018 Orientation: Looking west.	

Project Title: Pond 3N/S Excavation Sequence Photographic Documentation Log

PHOTO 59 Date:10/27/2018 Orientation: Looking northwest.	
PHOTO 60 Date:10/30/2018 Orientation: Looking west.	

Project Title: Pond 3N/S Excavation Sequence Photographic Documentation Log	
PHOTO 61 Date:10/31/2018 Orientation: Looking west.	
PHOTO 62 Date:11/1/2018 Orientation: Looking southwest.	

Project Title: Pond 3N/S Excavation Sequence Photographic Documentation Log

PHOTO 63

Date:11/2/2018

Orientation: Looking southwest.

APPENDIX C

Bottom Ash Pond 3 N/S Grid Node Photographic Documentation Log

Project Title: Pond 3N/S Grid Node Photographic Documentation Log

PHOTO 1 **Node Number:** 2R2 **Location:** North 50, East 2050 **Colorimeter Result:** 32.60 percent CCR **Microscopy Result:** 2 percent CCR Note: Sample contains some dark organic debris and exhibits browner tint than base sand on which reference curves are based. Node location near layer of dark brown silty sand and black organics, as sampled and analyzed in the test pit locations.	
PHOTO 2 **Node Number:** 4 **Location:** North 150, East 2050 **Colorimeter Result:** N/A **Microscopy Result:** N/A **Note:** Node location near layer of dark brown silty sand and black organics, as sampled and analyzed in the test pit locations.	

Project Title: Pond 3N/S Grid Node Photographic Documentation Log

PHOTO 3 **Node Number:** 7 **Location:** North 300, East 2050 **Colorimeter Result:** 7.83 percent CCR **Microscopy Result:** 1 percent CCR **Note:** Sand includes dark organic material, mainly root fragments.	
PHOTO 4 **Node Number:** 8 **Location:** North 350, East 2050 **Colorimeter Result:** N/A **Microscopy Result:** N/A	

Project Title: Pond 3N/S Grid Node Photographic Documentation Log

PHOTO 5

Node Number: 10
Location: North 0, East 2100
Colorimeter Result: N/A
Microscopy Result: N/A
Note: Node location near layer of dark brown silty sand and black organics, as sampled and analyzed in the test pit locations.

PHOTO 6

Node Number: 11
Location: North 50, East 2100
Colorimeter Result: 6.84 percent CCR
Microscopy Result: 3 percent CCR
Note: Residue occurs mainly as very fine, dark spheres of corroding magnetite.

Project Title: Pond 3N/S Grid Node Photographic Documentation Log

PHOTO 7 **Node Number:** 13 **Location:** North 150, East 2100 **Colorimeter Result:** 4.24 percent CCR **Microscopy Result:** N/A	
PHOTO 8 **Node Number:** 17 **Location:** North 350, East 2100 **Colorimeter Result:** N/A **Microscopy Result:** N/A	

Project Title: Pond 3N/S Grid Node Photographic Documentation Log	
PHOTO 9 **Node Number:** 19 **Location:** North 450, East 2100 **Colorimeter Result:** 2.36 percent CCR	
PHOTO 10 **Node Number:** 21 **Location:** North 550, East 2100 **Colorimeter Result:** 0.0 percent CCR	

Project Title: Pond 3N/S Grid Node Photographic Documentation Log	
PHOTO 11 **Node Number:** 22 **Location:** North 600, East 2100 **Colorimeter Result**: N/A	
PHOTO 12 **Node Number:** 27 **Location:** North 850, East 2100 **Colorimeter Result:** 2.70 percent CCR **Note:** Dark brown sand, trace black silt.	

Project Title: Pond 3N/S Grid Node Photographic Documentation Log

PHOTO 13 **Node Number:** 28 **Location:** North 0, East 2150 **Colorimeter Result:** Non detectable (ND), -0.95 percent CCR **Microscopy Result:** N/A	
PHOTO 14 **Node Number:** 30 **Location:** North 100, East 2150 **Colorimeter Result:** ND, -0.34 percent CCR **Microscopy Result:** N/A	

Project Title: Pond 3N/S Grid Node Photographic Documentation Log

PHOTO 15 **Node Number:** 33 **Location:** North 250, East 2150 **Colorimeter Result:** N/A **Microscopy Result:** N/A	
PHOTO 16 **Node Number:** 34 **Location:** North 300, East 2100 **Colorimeter Result:** N/A **Microscopy Result:** N/A	

Project Title: Pond 3N/S Grid Node Photographic Documentation Log	
PHOTO 17 **Node Number:** 35 **Location:** North 350, East 2150 **Colorimeter Result:** N/A **Microscopy Result:** 1 percent CCR	
PHOTO 18 **Node Number:** 36 **Location:** North 400, East 2150 **Colorimeter Result:** 1.53 percent CCR	

Project Title: Pond 3N/S Grid Node Photographic Documentation Log

PHOTO 19 **Node Number:** 37 **Location:** North 450, East 2150 **Colorimeter Result:** N/A	
PHOTO 20 **Node Number:** 40 **Location:** North 600, East 2150 **Colorimeter Result:** N/A	

Project Title: Pond 3N/S Grid Node Photographic Documentation Log	
PHOTO 21 **Node Number:** 41 **Location:** North 650, East 2150 **Colorimeter Result:** N/A	
PHOTO 22 **Node Number:** 42 **Location:** North 700, East 2150 **Colorimeter Result:** 2.8 percent CCR	

Project Title: Pond 3N/S Grid Node Photographic Documentation Log

PHOTO 23 **Node Number:** 44 **Location:** North 800, East 2150 **Colorimeter Result:** 3.14 percent CCR	
PHOTO 24 **Node Number:** 45 **Location:** North 850, East 2150 **Colorimeter Result:** N/A **Notes:** Dark brown to gray sand with clay, trace organics similar to material observed in Test Pits 3077 and 3078. *Surveying rod used for scale.	

Project Title: Pond 3N/S Grid Node Photographic Documentation Log

PHOTO 25 **Node Number:** 47 **Location:** North 50, East 2200 **Colorimeter Result:** N/A **Microscopy Result:** N/A	
PHOTO 26 **Node Number:** 51 **Location:** North 250, East 2200 **Colorimeter Result:** ND, -0.67 percent CCR **Microscopy Result:** N/A	

Project Title: Pond 3N/S Grid Node Photographic Documentation Log	
PHOTO 27 **Node Number:** 52 **Location:** North 300, East 2200 **Colorimeter Result:** 0.04 percent CCR **Microscopy Result:** N/A	
PHOTO 28 **Node Number:** 55 **Location:** North 450, East 2200 **Colorimeter Result:** N/A	

Project Title: Pond 3N/S Grid Node Photographic Documentation Log	
PHOTO 29 **Node Number:** 59 **Location:** North 650, East 2200 **Colorimeter Result:** 3.96 percent CCR	
PHOTO 30 **Node Number:** 61 **Location:** North 750, East 2200 **Colorimeter Result:** 1.71 percent CCR	

Project Title: Pond 3N/S Grid Node Photographic Documentation Log	
PHOTO 31 **Node Number:** 62 **Location:** North 800, East 2200 **Colorimeter Result:** 0.0 percent CCR	
PHOTO 32 **Node Number:** 63 **Location:** North 850, East 2200 **Colorimeter Result:** 0.99 percent CCR	

Project Title: Pond 3N/S Grid Node Photographic Documentation Log	
PHOTO 33 **Node Number:** 65 **Location:** North 50, East 2250 **Colorimeter Result:** N/A **Microscopy Result:** N/A	
PHOTO 34 **Node Number:** 66 **Location:** North 100, East 2250 **Colorimeter Result:** ND, -0.35 percent CCR **Microscopy Result:** N/A	

Project Title: Pond 3N/S Grid Node Photographic Documentation Log

PHOTO 35 **Node Number:** 69 **Location:** North 250, East 2250 **Colorimeter Result:** N/A **Microscopy Result:** N/A	
PHOTO 36 **Node Number:** 70 **Location:** North 300, East 2250 **Colorimeter Result:** N/A **Microscopy Result:** N/A	

Project Title: Pond 3N/S Grid Node Photographic Documentation Log

PHOTO 37 **Node Number:** 71 **Location:** North 350, East 2050 **Colorimeter Result:** N/A **Microscopy Result:** N/A **Note:** Whiteboard is labeled incorrectly, location of picture is Node 71 underneath trestle. Dark material consists of silty sand and organics.	
PHOTO 38 **Node Number:** 73 **Location:** North 450, East 2250 **Colorimeter Result:** N/A	

Project Title: Pond 3N/S Grid Node Photographic Documentation Log

PHOTO 39 **Node Number:** 74 **Location:** North 500, East 2250 **Colorimeter Result:** N/A **Notes:** Dark brown sand, trace black silt similar to material found in Test Pit 3076.	
PHOTO 40 **Node Number:** 75 **Location:** North 550, East 2250 **Colorimeter Result:** 4.74 percent CCR	

Project Title: Pond 3N/S Grid Node Photographic Documentation Log

PHOTO 41 **Node Number:** 79 **Location:** North 750, East 2250 **Colorimeter Result:** N/A	
PHOTO 42 **Node Number:** 81 **Location:** North 850, East 2250 **Colorimeter Result:** N/A	

Project Title: Pond 3N/S Grid Node Photographic Documentation Log

PHOTO 43

Node Number: 82
Location: North 0, East 2300
Colorimeter Result: N/A
Microscopy Result: N/A

PHOTO 44

Node Number: 83
Location: North 50, East 2300
Colorimeter Result: 19.05 percent CCR
Microscopy Result: 1 percent CCR
Note: Sand exhibits more orange tint than base sand on which reference curves are based.

Project Title: Pond 3N/S Grid Node Photographic Documentation Log

PHOTO 45

Node Number: 85
Location: North 150, East 2300
Colorimeter Result: 8.82 percent CCR
Microscopy Result: 2 percent CCR
Note: Coarser sand observed at node location. Sample also contains some dark organic debris.

PHOTO 46

Node Number: 86R1
Location: North 200, East 2300
Colorimeter Result: ND, -1.35 percent CCR
Microscopy Result: N/A

Project Title: Pond 3N/S Grid Node Photographic Documentation Log

PHOTO 47 **Node Number:** 90 **Location:** North 400, East 2300 **Colorimeter Result:** N/A	
PHOTO 48 **Node Number:** 91 **Location:** North 450, East 2300 **Colorimeter Result:** N/A	

Project Title: Pond 3N/S Grid Node Photographic Documentation Log	
PHOTO 49 **Node Number:** 92 **Location:** North 500, East 2300 **Colorimeter Result:** N/A **Notes:** Dark brown sand, trace black silt similar to material identified in Test Pit 3076.	
PHOTO 50 **Node Number:** 93 **Location:** North 550, East 2300 **Colorimeter Result:** N/A	

Project Title: Pond 3N/S Grid Node Photographic Documentation Log	
PHOTO 51 **Node Number:** 98 **Location:** North 800, East 2300 **Colorimeter Result:** 0.64 percent CCR	
PHOTO 52 **Node Number:** 102 **Location:** North 100, East 2350 **Colorimeter Result:** 4.23 percent CCR **Microscopy Result:** N/A	

Project Title: Pond 3N/S Grid Node Photographic Documentation Log	
PHOTO 53 **Node Number:** 103 **Location:** North 150, East 2350 **Colorimeter Result:** 2.76 percent CCR **Microscopy Result:** N/A	
PHOTO 54 **Node Number:** 104 **Location:** North 200, East 2300 **Colorimeter Result:** N/A **Microscopy Result:** N/A	

Project Title: Pond 3N/S Grid Node Photographic Documentation Log

PHOTO 55 **Node Number:** 107 **Location:** North 350, East 2350 **Colorimeter Result:** 14.81 percent CCR **Microscopy Result:** 1 percent CCR **Note:** Sample contains dark organic debris.	
PHOTO 56 **Node Number:** 108 **Location:** North 400, East 2350 **Colorimeter Result:** N/A **Notes:** Dark brown sand with traces of black silty sand.	

Project Title: Pond 3N/S Grid Node Photographic Documentation Log

PHOTO 57

Node Number: 110
Location: North 500, East 2350
Colorimeter Result: 3.89 percent CCR
Notes: Dark brown sand, trace black silt similar to material found in Test Pit 3076.

PHOTO 58

Node Number: 111
Location: North 550, East 2350
Colorimeter Result: 1.31 percent CCR

Project Title: Pond 3N/S Grid Node Photographic Documentation Log	
PHOTO 59 **Node Number:** 114 **Location:** North 700, East 2350 **Colorimeter Result:** 0.73 percent CCR	
PHOTO 60 **Node Number:** 116 **Location:** North 800, East 2350 **Colorimeter Result:** 1.55 percent CCR **Notes:** Dark brown to black sand, trace organics.	

Project Title: Pond 3N/S Grid Node Photographic Documentation Log	
PHOTO 61 **Node Number:** 117 **Location:** North 850, East 2350 **Colorimeter Result:** 1.30 percent CCR	
PHOTO 62 **Node Number:** 119 **Location:** North 50, East 2400 **Colorimeter Result:** N/A **Microscopy Result:** N/A	

Project Title: Pond 3N/S Grid Node Photographic Documentation Log

PHOTO 63 **Node Number:** 121 **Location:** North 150, East 2400 **Colorimeter Result:** N/A **Microscopy Result:** N/A	
PHOTO 64 **Node Number:** 122 **Location:** North 200, East 2400 **Colorimeter Result:** N/A **Microscopy Result:** N/A	

Project Title: Pond 3N/S Grid Node Photographic Documentation Log	
PHOTO 65 **Node Number:** 123 **Location:** North 250, East 2400 **Colorimeter Result:** 2.74 percent CCR **Microscopy Result:** N/A	
PHOTO 66 **Node Number:** 126 **Location:** North 400, East 2400 **Colorimeter Result:** N/A **Notes:** The Node number in the photo is reported inncorrectly. This photo is of Node number 126.	

Project Title: Pond 3N/S Grid Node Photographic Documentation Log

PHOTO 67 **Node Number:** 132 **Location:** North 700, East 2400 **Colorimeter Result:** N/A	
PHOTO 68 **Node Number:** 133 **Location:** North 750, East 2400 **Colorimeter Result:** 0.16 percent CCR	

Project Title: Pond 3N/S Grid Node Photographic Documentation Log	
PHOTO 69 **Node Number:** 134 **Location:** North 800, East 2400 **Colorimeter Result:** 0.35 percent CCR	
PHOTO 70 **Node Number:** 138 **Location:** North 150, East 2450 **Colorimeter Result:** N/A **Microscopy Result:** N/A	

Project Title: Pond 3N/S Grid Node Photographic Documentation Log

PHOTO 71 **Node Number:** 139 **Location:** North 200, East 2450 **Colorimeter Result:** N/A **Microscopy Result:** N/A **Note:** Whiteboard node location labed incorrectly (photo 71 shows Node 156).	
PHOTO 72 **Node Number:** 141 **Location:** North 300, East 2450 **Colorimeter Result:** 13.50 percent CCR **Microscopy Result:** 2 percent CCR **Note:** Sample contains some dark organic debris.	

Project Title: Pond 3N/S Grid Node Photographic Documentation Log

PHOTO 73 **Node Number:** 144 **Location:** North 450, East 2450 **Colorimeter Result:** N/A	
PHOTO 74 **Node Number:** 145 **Location:** North 500, East 2450 **Colorimeter Result:** 1.78 percent CCR **Notes:** Dark brown sand with traces of black silty sand.	

Project Title: Pond 3N/S Grid Node Photographic Documentation Log	
PHOTO 75 **Node Number:** 146 **Location:** North 550, East 2450 **Colorimeter Result:** 0.0 percent CCR	
PHOTO 76 **Node Number:** 148 **Location:** North 650, East 2450 **Colorimeter Result:** 2.79 percent CCR	

Project Title: Pond 3N/S Grid Node Photographic Documentation Log	
PHOTO 77 **Node Number:** 149 **Location:** North 700, East 2450 **Colorimeter Result:** 1.38 percent CCR	
PHOTO 78 **Node Number:** 153 **Location:** North 100, East 2500 **Colorimeter Result:** N/A **Microscopy Result:** N/A	

Project Title: Pond 3N/S Grid Node Photographic Documentation Log

PHOTO 79

Node Number: 155
Location: North 200, East 2500
Colorimeter Result: 3.48 percent CCR
Microscopy Result: N/A

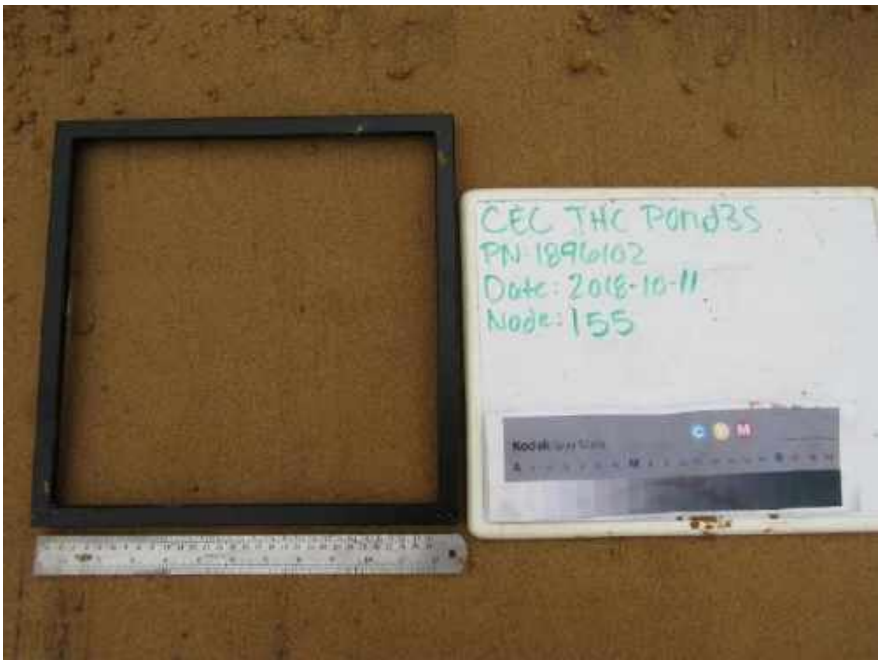


PHOTO 80

Node Number: 156
Location: North 250, East 2500
Colorimeter Result: N/A
Microscopy Result: N/A

Project Title: Pond 3N/S Grid Node Photographic Documentation Log

PHOTO 81 **Node Number:** 159 **Location:** North 400, East 2500 **Colorimeter Result:** N/A **Notes:** Dark brown sand, trace black silty sand.	
PHOTO 82 **Node Number:** 160 **Location:** North 450, East 2500 **Colorimeter Result:** 2.16 percent CCR **Notes:** Dark brown sand with traces of black silty sand.	

Project Title: Pond 3N/S Grid Node Photographic Documentation Log

PHOTO 83 **Node Number:** 162 **Location:** North 550, East 2500 **Colorimeter Result:** 1.21 percent CCR **Notes:** Dark brown sand with traces of black silty sand, trace organics.	
PHOTO 84 **Node Number:** 163 **Location:** North 600, East 2500 **Colorimeter Result:** N/A	

Project Title: Pond 3N/S Grid Node Photographic Documentation Log

PHOTO 85 **Node Number:** 164 **Location:** North 650, East 2500 **Colorimeter Result:** N/A **Notes:** Dark brown sand with traces of black silty sand.	
PHOTO 86 **Node Number:** 169 **Location:** North 650, East 2550 **Colorimeter Result:** 1.88 percent CCR **Notes:** Dark brown sand with traces of black silty sand.	

Project Title: Pond 3N/S Grid Node Photographic Documentation Log	
PHOTO 87 **Node Number:** 171 **Location:** North 750, East 2550 **Colorimeter Result:** N/A	
PHOTO 88 **Node Number:** 172 **Location:** North 800, East 2550 **Colorimeter Result:** 0.70 percent CCR	

Project Title: Pond 3N/S Grid Node Photographic Documentation Log	
PHOTO 89 **Node Number:** 173 **Location:** North 850, East 2550 **Colorimeter Result:** 1.78 percent CCR	

APPENDIX D

CTL Group CCR Removal Microscopy Memo

CTLGroup MEMO

Project No.: 150283
To: Jeff Piaskowski, Golder Associates, Inc.

Date: March 21, 2019
From: Laura Powers

Subject: **Laboratory Re-Examination of CCR Pond 3S Colorimetry Fail Samples**

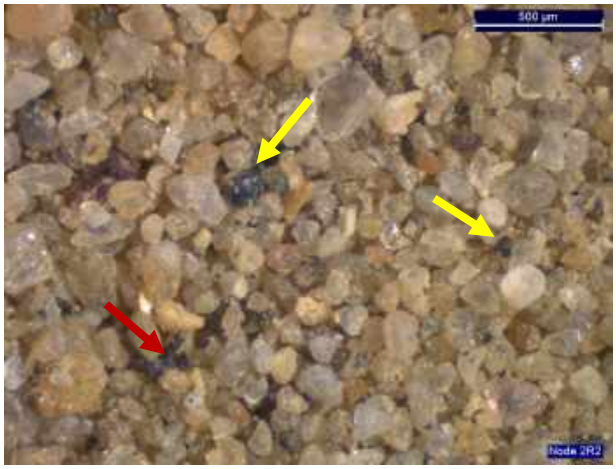
CTLGroup has re-analyzed a suite of field samples from the Pond 3 nodes listed in Table 1 to estimate the amount of CCR and provide micrographs illustrating the general characteristics of the soil. Field colorimetry values for these samples exceeded the 5% threshold. Field microscopy determined that the amount of CCR in each sample was less than this value. Estimates made in the laboratory confirm that the amount of CCR is less than 5%.

TABLE 1 POND 3 NODE SAMPLES

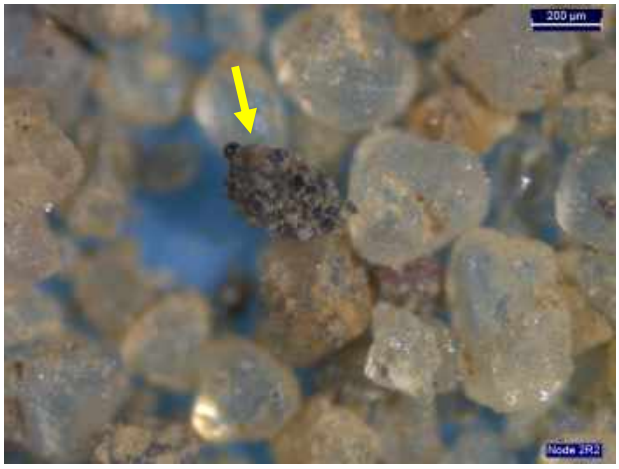
Nodes	Field Microscopy Estimate of CCR%	Laboratory Estimate of CCR %
2R2	4	2
7	1 to 3	1
11	<3	3
35	<1	1
83	<2	1
85	2 to 4	2
107	<2	1
141	1 to 3	2

The attached pages contain laboratory stereomicroscope photographs of each re-test sample taken at progressive higher magnifications. The amount of CCR was visually estimated in at least ten fields of view at magnifications of 25X to 50X using comparison charts (“Summary Concerning Some Additional Aids in Studying Sedimentary Formations,” Terry, R.D. and Chilingar, G.V., 1955, and re-produced in many soils, mineralogy, and petrology text books).

The sample contains abundant darker colored rocks and minerals. Red particles are granite. Many gray particles are schist. The region in the yellow box is shown below.



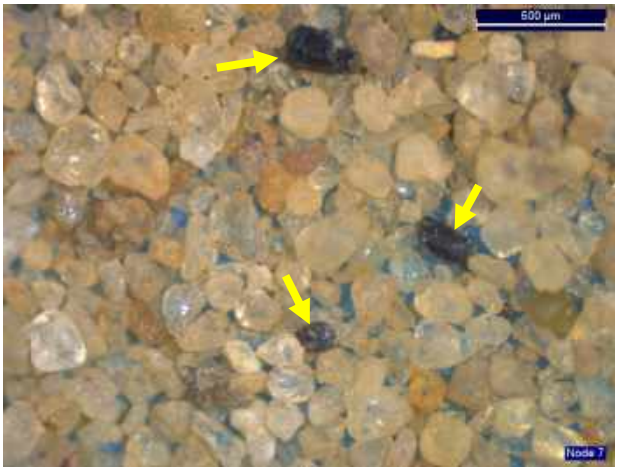
Yellow arrows show CCR particles. Red arrow shows plant material.



Arrow shows CCR particle that contains embedded glass spheres.

Node 2R2 Estimated CCR content is 2%. The color of the sample is influenced by silty coatings on sand particles, minor plant material, and the abundance of darker colored minerals and rocks.

Major constituents are colorless, white and pale yellow quartz, white and pink feldspar, and darker colored particles of various rock types.

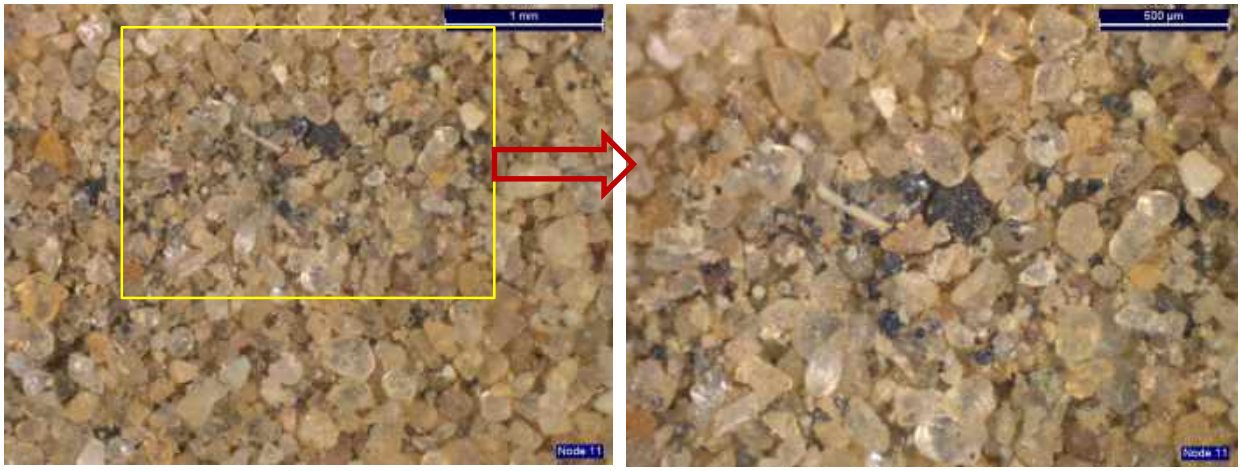


Arrows shows CCR particles.

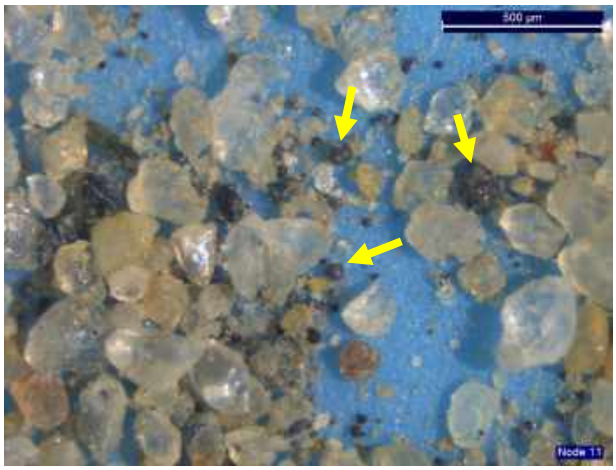
Arrows show plant material.

Arrows show CCR particles.

Node 7 Estimated CCR content is 1%. The color of the sample is influenced by a light silty coating on sand particles, small amounts of plant material, and small amounts of darker colored minerals and rocks.



Sand particles are lightly coated with yellow-buff silty material. The micrographs show a concentration of black CCR particles.

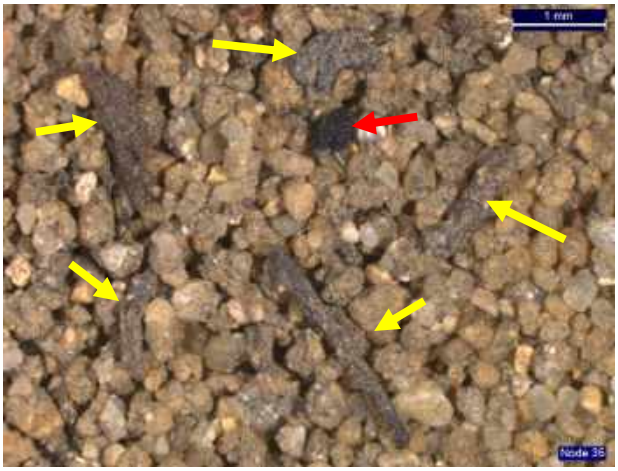


Arrows show examples of black spherical CCR particles.

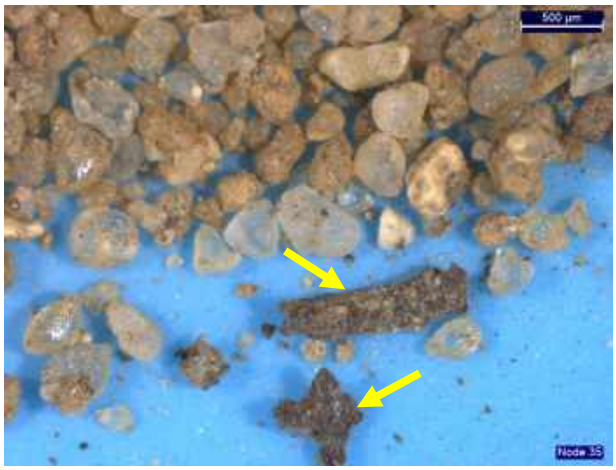
Arrow shows a typical black porous carbon CCR particle.

Node 11 Estimated CCR content is 3%. The color of the sample is influenced by yellow-buff coatings and to a lesser extent by minute CCR particles and darker colored rocks and minerals in the predominantly quartz sand.

The sand is lightly coated with yellow-buff silty material.



Yellow arrows shows plant material. Red arrow shows CCR particle.



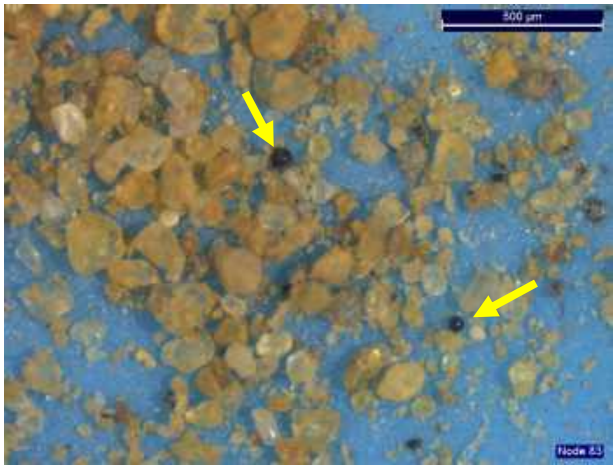
Arrows show plant material.

Arrow shows black CCR particle partially coated with silty material.

Node 35 Estimated CCR content is 1%. The color of the sample is influenced by a light silty coating on sand particles and small amounts of plant material.

Red arrows show red-black granite particles. The sand is heavily coated with yellow silty material.

Closer view of coated sand particles.



Arrows show spherical black CCR particles.

Arrow shows black porous CCR particle partially coated with silty material.

Node 83 Estimated CCR content is 1%. The color of the sample is influenced by yellow silty coatings on sand particles, and by the presence of darker colored rocks and minerals in the sand.

Quartz particles are mostly colorless transparent to white and pale yellow. Colored particles are mostly chert, granite, schist and feldspar. The sand is generally free of silty material.

Red-black particles are granite. Arrow shows a CCR particle.

Yellow arrows show black CCR particles, one heavily coated with silty material. Red arrow shows plant material.

Arrow shows black porous CCR particle. The field of view also shows several minute black spheres of CCR.

Node 85 Estimated CCR content is 2%. The color of the sample is mainly influenced by the abundance of darker colored rocks and minerals in the sand.

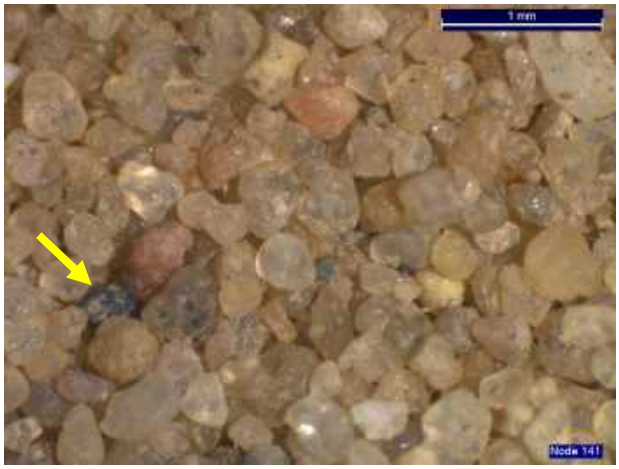
The sand is lightly coated with buff silty material and locally heavily coated with yellow silty material. Red arrow shows plant material. Yellow arrow shows CCR.

Some sand particles are loosely bound together by silty material.

Arrows show CCR particles.

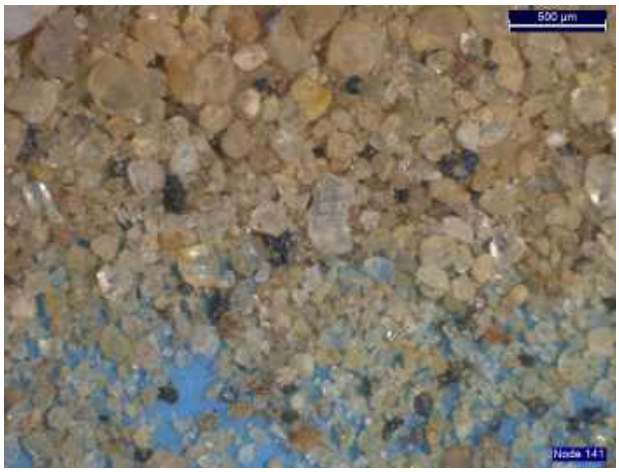
Arrow shows black CCR particle.

Node 107 Estimated CCR content is 1%. The color of the sample is mainly influenced by the coatings on particles.



The sand is lightly coated with buff silty material Yellow arrow shows CCR.

Yellow arrow shows a black CCR particle.



Black particles, some spherical, are CCR.

Large CCR particle containing a few embedded glass spheres.

Node 141 Estimated CCR content is 2%. The color of the sample is mainly influenced by the presence of coatings on particles and the presence of darker colored sand particles.

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