To: Operating Record

From: Bethany Swanberg BLS
Risk Management

Date: September 15, 2023

Subject: JH Campbell Ponds 1-2 North and 1-2 South Coal Combustion Residual (CCR) 40 CFR 257.98(e) Completion of Remedy Letter Report

CC: Heather Prentice, Risk Management
Harold D. Register, Jr., Risk Management

Consumers Energy (CE) has prepared this Completion of Remedy Report (Report) for the JH Campbell Ponds 1-2 North and 1-2 South CCR Unit (Ponds 1-2) to document successful completion of the selected remedy per §257.98(c) and satisfy the notification requirement of §257.98(e) of 40 CFR Parts 257 and 261, Disposal of Coal Combustion Residuals from Electric Utilities, under subtitle D of the Resource Conservation and Recovery Act (RCRA), also known as the Coal Combustion Residuals (CCR) rule. On July 21, 2023, CE posted the JH Campbell Ponds 1-2 North and 1-2 South Coal Combustion Residual (CCR) Unit 40 CFR 257.97(a) Selection of Remedy Letter Report (Remedy Selection Report) to the operating record and public facing CCR website (Consumers Energy, July 2023).

The Remedy Selection Report identified Source Removal with Post Remedy Monitoring as the selected remedy for Ponds 1-2 pursuant to §257.97. The remedy addressed the potential for residual arsenic associated with Ponds 1-2 activities and established the following schedule for implementing and completing the remedy required by §257.97(d):

Source Removal of CCR	June 2018 – October 2018	Complete
Post-Removal Groundwater Monitoring	October 2018 until groundwater protection standard (GWPS) achieved for 3 years	Complete
Start Post-Removal Performance Review	January 2019	Complete
Remedy Completion Certification	Upon meeting GWPS consecutively for 3 years	Complete - Included in this Report

This Report documents that the remedy selected pursuant to §257.97 is complete according to the criteria set forth in §257.98(c):

- The GWPS for arsenic of 10 ug/L, as established under §257.95(h), has been achieved at all Ponds 1-2 downgradient compliance monitoring points, including the nature and extent wells. The corrective action monitoring data further demonstrates that there have not been any GWPS exceedances at any of the downgradient wells, including nature and extent monitoring wells, under the post-remedy groundwater flow regime.

- Compliance with the GWPS established under §257.95(h) has been achieved for a period of four years, which exceeds the minimum requirement of three consecutive years, using the statistical procedures and performance standards in §257.93(f) and (g).

- All actions required to complete the remedy have been satisfied.

Corrective Action Overview

Ponds 1-2 are former bottom ash ponds that were part of a wet ash handling system used at the JH Campbell solid waste disposal facility until 2018. CCR were removed from Ponds 1-2 in 2018 and all wet ash processes at the facility have been replaced with concrete bottom ash treatment tanks. The location of the former Ponds 1-2 is shown on Figure 1.

The "Notification of Appendix IV Constituent Exceeding Groundwater Protection Standard per §257.95(g)" (Consumers Energy Company, January 2019) was issued pursuant to §257.95(g) and the "Assessment of Corrective Measures Report" (ACM) (TRC, September 2019) was completed pursuant to §257.96 in response to the Appendix IV constituent arsenic having been detected at a statistically significant level exceeding the established federal GWPS within the certified compliance well network as follows:

Unit with GWPS Exceedance	Constituent	# of Downgradient Wells Observed
Ponds 1-2	Arsenic	2 of 5

Five remedial approaches were evaluated and presented in the ACM based on source control by removing CCR in Ponds 1-2. Source removal was completed in 2018. The extent of the Ponds 1-2 excavation area and former wet ash boundary are shown on Figure 1 along with the monitoring well network. Since the initiation of the assessment monitoring program in May 2018, CE has continued to monitor Ponds 1-2 semiannually for Appendix III and IV constituents in conformance with §257.90 - §257.98.

Groundwater monitoring and nature and extent evaluation performed subsequent to source removal was used to inform the final remedy selection of ACM Alternative 2a: Source Removal with Post Remedy Monitoring. The Remedy Selection Report established that the selected remedy meets the standards set forth in §257.97(b) for Ponds 1-2 to address the potential for residual arsenic associated with Ponds 1-2 operation. As detailed below in this Report, groundwater data collected post-CCR removal demonstrates that the remedy is complete per the criteria set forth in §257.98(c) and the remedy is protective of human health and the environment.

Pond Closure and Source Removal

CE worked with qualified professional engineers and the Michigan Department of Environment, Great Lakes, and Energy (EGLE) to achieve closure objectives under the Federal CCR Rule and to align with requirements under the Michigan Part 115-Solid Waste Management of the Natural Resources and Environmental Protection Act, 1194 PA 451, as amended (Part 115). CE completed CCR removal at Ponds 1-2 as documented in the "JH Campbell Generating Facility Bottom Ash Ponds 1-2 Closure Plan" (Golder, January 2018) pursuant to §257.102. The December 2017 "Bottom Ash Ponds 1-2 Closure Work Plan" was submitted to the EGLE on December 5, 2017, and approved by the EGLE on February 26, 2018. Dewatering and removal of ash from Ponds 1-2 for beneficial reuse began in June 2018 and continued through September 2018. CCR removal activities were completed in October 2018 and CE submitted final documentation of CCR removal, including certification from a qualified professional engineer (QPE), to EGLE in the "JH Campbell Generating Facility Bottom Ash Ponds 1-2 N/S CCR Removal Documentation Report" (CCR Removal Documentation Report) (Golder, August 2019) (included as Attachment 1 of this Report). On October 22, 2019, EGLE provided written concurrence that all bottom ash had been removed from Ponds 1-2 in accordance with Part 115 based on observations by EGLE staff during the removal process and the multiple lines of evidence described in the CCR Removal Documentation Report (included in Attachment 2 of this Report).

Following CCR removal, the Ponds 1-2 excavation was backfilled with clean fill to promote stormwater drainage and minimize the potential for ponding of surface water. The surface was vegetated to minimize erosion and any future maintenance of the restored area. An overview of the excavation boundary, former pond boundary, and associated monitoring well layout is included in Figure 1.

As detailed in the CCR Removal Documentation Report, Ponds 1-2 were dewatered during CCR excavation in late August and early September 2018. Approximately 800,000 gallons of water were removed per day during the dewatering period, for a total removal of nearly 11.5 million

gallons. CCR from Ponds 1-2 was excavated to at least the elevation of the base of CCR established by plant drawings and verified through soil borings. Following initial excavation, CCR removal was verified visually at nodes established according to EGLE guidance "Sampling Strategies and Statistics Training Materials for Part 201 Cleanup Criteria (S3TM)". If any CCR were visible, additional material was removed. When no CCR or only trace amounts of CCR remained, a colorimetric analysis using a digital colorimeter to precisely measure the color of a soil sample was developed to confirm CCR removal. Sampled grid nodes passed colorimetric confirmation testing if the remaining surface contained no more than 5 percent CCR material. Grid nodes which did not pass colorimetric testing were further examined by microscopy. Microscopic analysis confirmed that these grid nodes contained no more than 5 percent CCR material. If the remaining surface at a grid node was confirmed to contain more than 5 percent CCR material, additional excavation was performed. These multiple lines of evidence confirmed that all CCR material was removed from Ponds 1-2.

Remedy Selection and Completion Assessment Activities

Since the initiation of the assessment monitoring program in May 2018, CE has monitored Ponds 1-2 semiannually for Appendix III and IV constituents in conformance with §257.90 - §257.98, which includes semiannual assessment monitoring in accordance with §257.95 to monitor post-source removal groundwater conditions and inform the remedy selection. The annual groundwater monitoring reports are available on the CE public-facing website[1].

As documented in the "2020 Annual Groundwater Monitoring and Corrective Action Report for the JH Campbell Power Plant Units 1-2 North and 1-2 South CCR Unit" (2020 Annual Report) (TRC, January 2021), due to the cessation of hydraulic loading and decommissioning of Ponds 1-2, the groundwater flow direction changed significantly from the initial baseline and assessment monitoring events such that groundwater flow is generally toward the south at Ponds 1-2. The change in the groundwater flow regime that occurred post-remedy is shown by comparing attached Figure 2 that depicts the 2017 pre-remedy conditions and Figure 3 that shows the current 2022 post-remedy condition. As a result, the groundwater monitoring well network was evaluated and revised to meet the performance objectives under the CCR rule. The revised monitoring well network was recertified and included in the 2020 Annual Report. The new groundwater monitoring system consisted of three downgradient wells (JHC-MW-15005, JHC-

[1] Consumers Energy CCR Rule Compliance Data and Information website: https://www.consumersenergy.com/community/sustainability/environment/waste-management/coal-combustion-residuals

MW-18004, and JHC-MW-18005) and two side gradient wells (JHC-MW-15002 and JH-MW-15003). JHC-MW-15001 was removed from the monitoring network post-pond decommissioning given the well is located upgradient relative to Ponds 1-2, dry conditions had been observed, and no Appendix IV constituents had been observed at statistically significant levels (SSLs) above GWPSs at that location since monitoring began in 2015. Monitoring wells JHC-MW-15002 and JHC-MW-15003, although located side gradient of Ponds 1-2, continued to be used to monitor post-CCR removal changes in groundwater quality since groundwater concentrations at those wells had contributed to the initiation of assessment monitoring.

As discussed in the "2021 Annual Groundwater Monitoring and Corrective Action Report for the JH Campbell Power Plant Units 1-2 North and 1-2 South CCR Unit" (2021 Annual Report) (TRC, January 2022), the results of the April 2021 assessment monitoring event indicated a new SSL above the GWPS for selenium at JHC-MW-15005. The SSL for selenium at JHC-MW-15005 resulted from increases in concentrations observed after the cessation of hydraulic loading at Ponds 1-2 in 2018 and an associated change in local groundwater flow. An Alternate Source Demonstration (ASD) for the selenium SSL was completed in accordance with §257.95(g)(3)(ii) (TRC, October 2021) and is included in the 2021 Annual Report. The multiple lines of evidence presented in the ASD show that the SSL is attributed to a system of closed, pre-existing units licensed under Michigan solid waste rules that are adjacent to Ponds 1-2 and support the determination that wells JHC-MW-15002, JHC-MW-15003, and JHC-MW-15005 are not appropriate for use in assessment monitoring at Ponds 1-2. The closed, pre-existing units are not currently regulated under the CCR Rule; however, remedial action is being taken under Consent Agreement WMRPD No. 115-01-2018.

As detailed in the "2022 Annual Groundwater Monitoring and Corrective Action Report for the JH Campbell Power Plant Units 1-2 North and 1-2 South CCR Unit" (2022 Annual Report) (TRC, January 2023), JHC-MW-15002, JHC-MW-15003, and JHC-MW-15005 were removed from the certified compliance monitoring network for Ponds 1-2 and have continued to be monitored as nature and extent wells for the purpose of informing the remedy selection and ongoing risk mitigation evaluation under the state program. JHC-MW-22001 was added to the downgradient monitoring network and the groundwater monitoring network was recertified in January 2023 and included in the 2022 Annual Report. Additional monitoring wells MW-22-14 and MW-22-15 were installed within the footprint of Ponds 1-2 in late 2022 to further assess the effectiveness of source removal at Ponds 1-2. The data from monitoring wells MW-22-14 and MW-22-15 show that groundwater quality directly beneath the former Ponds 1-2 footprint is well below the GWPSs for all of the Appendix IV constituents.

Arsenic concentrations in groundwater during the 2022 monitoring period are below the GWPS at each well within the current monitoring network (certified January 2023). Arsenic

concentrations are also below the GWPS at the nature and extent wells installed in the interior of the Ponds 1-2 footprint and downgradient/east at monitoring well JHC-MW-15005, as detailed in the 2022 Annual Report. The data collected during additional semi-annual sampling performed in April 2023 further demonstrates that the GWPS is met for arsenic at Ponds 1-2. The nature and extent analysis of groundwater monitoring downgradient from Ponds 1-2 further demonstrates that the remedy is protective of human health and the environment, as shown in the ACM and 2022 Annual Report.

Figures 4 and 5 illustrate the monitoring locations where statistically significant arsenic exceedances have been identified using groundwater data collected through 2018 and 2023, respectively. These data summary figures show that the downgradient monitoring wells within the certified well network and downgradient nature and extent wells have remained below the GWPS pre- and post-CCR removal, and that there are no arsenic GWPS exceedances in the interior of the Ponds 1-2 footprint post-CCR removal.

Statistically Significant Evidence that Clean-Up Criterion is Met under a Corrective Action Groundwater Monitoring Program

Statistical comparison to the GWPS using the groundwater data collected in the downgradient monitoring wells demonstrates that the clean-up criterion (i.e. GWPS) has been met using the statistical procedures and performance standards set forth in §257.93(f) and (g). Per the USEPA's Unified Guidance (USEPA, 2009), while a unit is in compliance/assessment monitoring, a statistical comparison is made to determine whether groundwater concentrations have increased above the established compliance standard to identify the need for corrective action. Once corrective action is required, the statistical evaluation of groundwater monitoring data is used to determine whether concentrations have decreased below a clean-up criterion or compliance level. In compliance/assessment monitoring, the lower confidence limit [LCL] is of primary interest, where an increase of the LCL above the GWPS is what triggers corrective action. Whereas the upper confidence limit [UCL] is most important in corrective action, where a UCL below the GWPS demonstrates that the compliance criterion has been met.

As discussed above, arsenic had exceeded the LCL at two of the compliance monitoring wells which had triggered corrective action at Ponds 1-2. As shown in Chart 1 below, arsenic concentrations in groundwater collected between January 2019 and April 2023 have remained statistically below the GWPS, with the UCL below the GWPS using data collected over four consecutive years post-CCR removal in all of the monitoring wells located downgradient of the former Ponds 1-2 footprint under the post-remedy groundwater flow regime. This provides statistically significant evidence demonstrating that the CCR removal activities were effective in

addressing potential arsenic concentrations above the GWPS associated with former Ponds 1-2 activities.

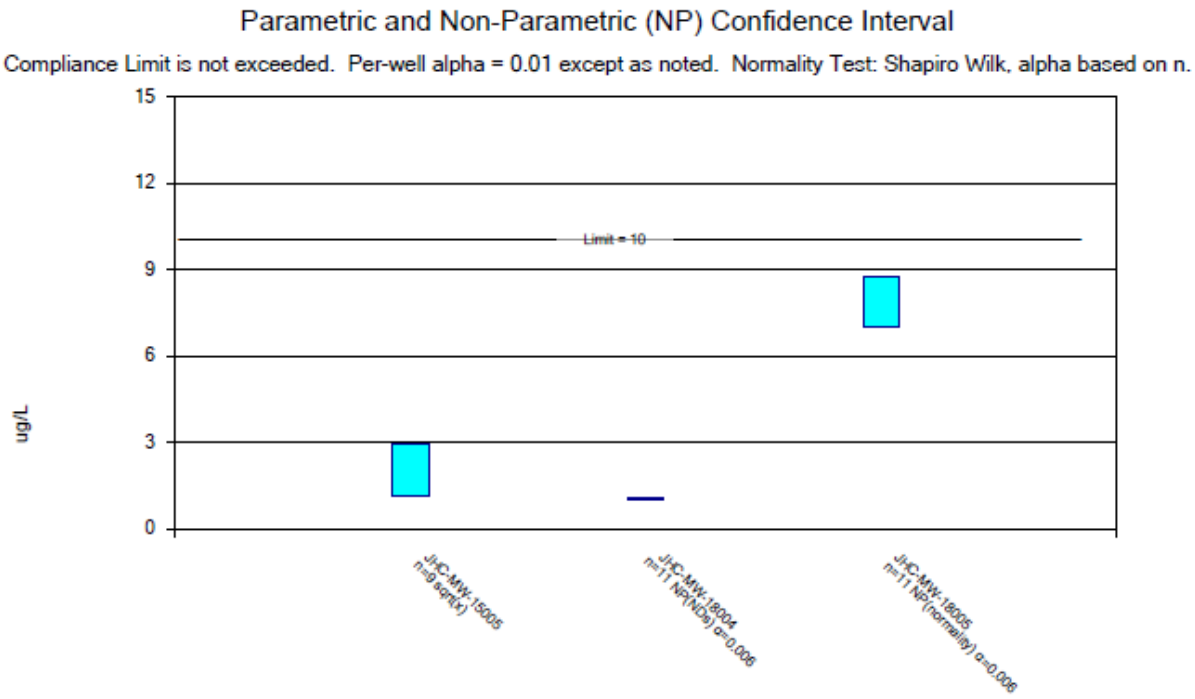
The schedule for implementation and remedial activities established under 257.97(d) requires a corrective action groundwater monitoring program be established and implemented that:

- At a minimum, meets the requirements of an assessment monitoring program under §257.95;
- Documents the effectiveness of the corrective action remedy; and
- Demonstrates compliance with the GWPS.

Implementation of the remedy is a combination of the CCR removal conducted in 2018 and the post-remedy monitoring conducted between January 2019 through April 2023. Following CCR removal, CE conducted over four years of consecutive monitoring along the downgradient edge of the former Ponds 1-2 footprint, which includes eleven groundwater monitoring events at JHC-MW-18004 and JHC-MW-18005 and nine groundwater monitoring events at JHC-MW-15005 between January 2019 and April 2023. Groundwater monitoring was performed in accordance with the assessment monitoring program developed pursuant to §257.95 as documented in the 2019 through 2022 annual groundwater monitoring reports. Documentation of the April 2023 groundwater monitoring event will be included in the forthcoming 2023 Annual Groundwater Monitoring and Corrective Action Report required under §257.90(e). This post-CCR removal dataset serves as both the assessment monitoring and the corrective action groundwater monitoring program dataset. The assessment monitoring dataset is used to assess the effectiveness of the remedy and demonstrate completion of the corrective action.

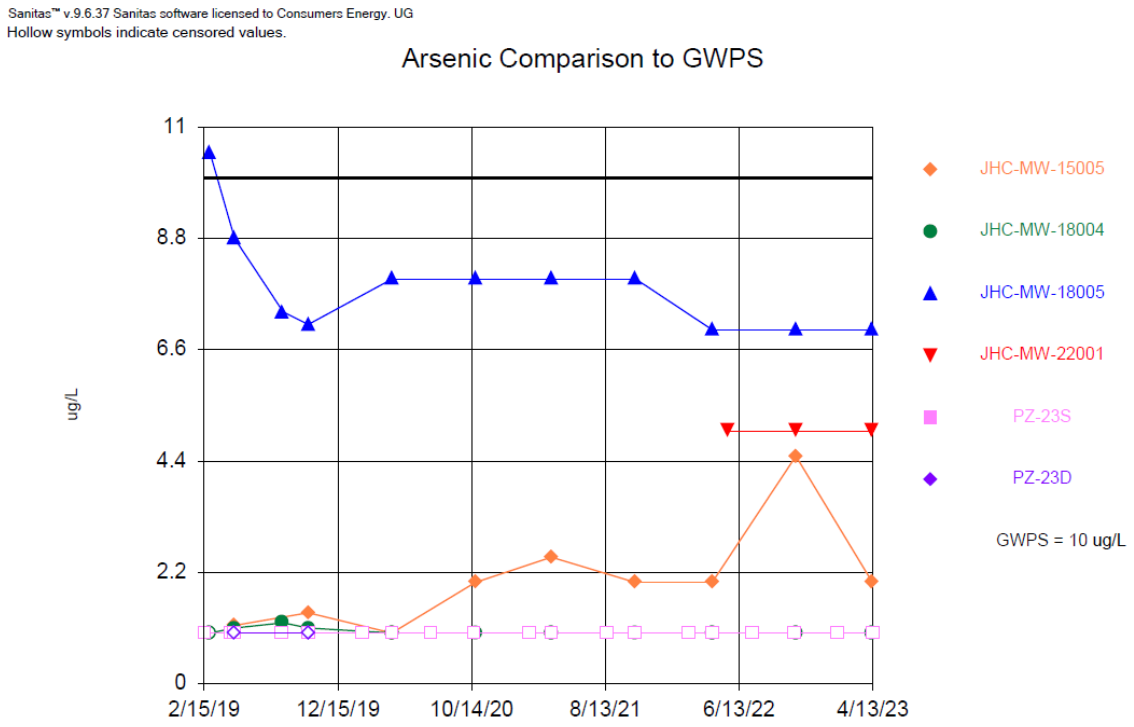
Statistical analysis of the post-CCR removal dataset collected between January 2019 through April 2023 was performed using confidence interval analysis statistical procedures and performance standards set forth in §257.93(f) and (g), as detailed in Attachment 3. The results of the statistical analysis demonstrate that the GWPS has been attained at Ponds 1-2 with all UCLs for arsenic well below the GWPS of 10 ug/L using the post-CCR removal dataset. Chart 1 below shows the arsenic UCLs below the GWPS for the monitoring wells along the downgradient edge of the former Ponds 1-2 footprint where statistical analysis was performed.

CHART 1: JHC PONDS 1-2 POST-CCR REMOVAL CONFIDENCE INTERVALS (99%) FOR ARSENIC IN GROUNDWATER AT DOWNGRADIENT MONITORING WELLS



The attainment of the GWPS is further demonstrated in the time-series plots below. All arsenic concentrations at the downgradient wells, at the compliance wells and the nature and extent wells, are consistently below the GWPS since 2019. Given that the GWPS has been attained for over four consecutive years, there is no need to implement any interim measures under §257.98(a)(3).

CHART 2: JHC PONDS 1-2 POST-CCR REMOVAL DOWNGRADIENT ARSENIC CONCENTRATIONS IN GROUNDWATER VS GROUNDWATER PROTECTION STANDARD



Remedy Completion

The Final Selection of Remedy Letter Report identified Source Removal with Post Remedy Monitoring as the final remedy selected pursuant to §257.97 for Ponds 1-2 to address the potential for residual arsenic. Data collected post-CCR removal that meet the requirements of 257.97(d) have demonstrated the relative effectiveness of the Source Removal with Post Remedy Monitoring remedy and show that the remedy completion considerations set forth under §257.98(c) have been satisfied.

Specifically, the remedy selected under §257.97 is satisfactorily complete pursuant to §257.98(c), based on the following:

- The GWPS for arsenic of 10 ug/L, as established under §257.95(h), has been achieved at all Ponds 1-2 downgradient compliance monitoring points and the nature and extent wells. As detailed in the ACM, there is no plume of contamination beyond the

groundwater monitoring well system established under §257.91. The corrective action monitoring data further demonstrates that there have not been any GWPS exceedances at any of the downgradient wells, including nature and extent monitoring wells, under the post-remedy groundwater flow regime.

- Compliance with the GWPS established under §257.95(h) has been achieved for a period of four consecutive years, more than the required minimum of three consecutive years, using the statistical procedures and performance standards in §257.93(f) and (g). As shown in Chart 1 and 2 provided above and in detail in Attachment 3, arsenic concentrations in groundwater collected between January 2019 and April 2023 have remained statistically below the GWPS, with the UCL below the GWPS, for over four consecutive years post-CCR removal in all of the monitoring wells located downgradient of the former Ponds 1-2 footprint, which includes the compliance wells (JHC-MW-18004, JHC-MW-18005, and JHC-MW-22001) and nature and extent wells (JHC-MW-15005, PZ-23s, and PZ-23d), under the post-remedy groundwater flow regime. This provides statistically significant evidence demonstrating that the CCR removal activities were effective in addressing arsenic concentrations associated with former Ponds 1-2 activities.

- All actions required to complete the remedy have been satisfied. The CCR Removal Documentation Report demonstrates that CCR removal has been completed in 2018, which precludes further releases of Appendix IV constituents into the environment. Four consecutive years of post-CCR removal groundwater monitoring demonstrates that the GWPS is met.

Per the requirements of §257.98(e), the qualified professional engineer certification attesting that the remedy has been completed in compliance with the requirements of §257.98(c) is included in Attachment 4.

Conclusion

The Source Removal with Post Remedy Monitoring remedy for Ponds 1-2 has been completed in accordance with §257.98. The CCR Removal Documentation Report demonstrates that CCR removal was completed in 2018, which precludes further releases of Appendix IV constituents into the environment. Four consecutive years of post-CCR removal groundwater monitoring demonstrates that the remedy is effective in attaining the GWPS and protecting human health and the environment.

Enclosures

Figures:
Figure 1 – Site Plan with Monitoring Well Locations
Figure 2 – Groundwater Contour Map, September 2017
Figure 3 – Groundwater Contour Map, October 2022
Figure 4 – Nature and Extent Summary – Arsenic GWPS Exceedances 2018
Figure 5 – Nature and Extent Summary – Arsenic GWPS Exceedances 2023

Attachment 1:
CCR Removal Documentation Report (Golder, August 2019)

Attachment 2:
EGLE CCR Removal Documentation Concurrence Letter

Attachment 3:
Statistical Analysis

Attachment 4:
Qualified Professional Engineering Certification

Attachment 5:
References

Figures

LEGEND

- APPROXIMATE WORKPLAN EXCAVATION BOUNDARY
- APPROXIMATE POND WETTED BOUNDARY
- DOWNGRADIENT POND A MONITORING WELL
- MONITORING WELL (STATIC WATER LEVEL ONLY)
- DECOMMISSIONED
- DOWNGRADIENT BOTTOM ASH POND 1/2 N/S MONITORING WELL (2018)
- DOWNGRADIENT BOTTOM ASH POND 1/2 N/S MONITORING WELL (2022)
- NATURE AND EXTENT/DOWNGRADIENT MONITORING WELLS

NOTES:

1. BASE MAP IMAGERY FROM GOOGLE EARTH PRO, 2021.
2. WELL LOCATIONS BASED ON SURVEY DATA THROUGH JUNE 15, 2022.
3. JHC-MW-1800X MONITORING WELLS INSTALLED IN DECEMBER 2018.
4. JHC-MW-15008R AND TW-19-XX MONITORING WELLS INSTALLED IN JUNE 2019.
5. JHC-MW-22001 MONITORING WELL INSTALLED MAY 12, 2022.

N

1:2,400
1" = 200'

0 100 200 FEET

PROJECT:	CONSUMERS ENERGY COMPANY JH CAMPBELL POWER PLANT WEST OLIVE, MICHIGAN
TITLE:	SITE PLAN WITH CCR MONITORING WELL LOCATIONS
DRAWN BY: A. FOJTIK	PROJ. NO.: 514398.0000.0000 P1T3
CHECKED BY: H. SCHNAIDT	FIGURE 1
APPROVED BY: S. HOLMSTROM	
DATE: SEPTEMBER 2023	

TRC
999 FOURIER DRIVE
SUITE 101
MADISON, WI 53717
PHONE: 608.826.3663

FILE: 464090_JHC.aprx

Coordinate System: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl; Map Rotation: 0
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TRC - GIS

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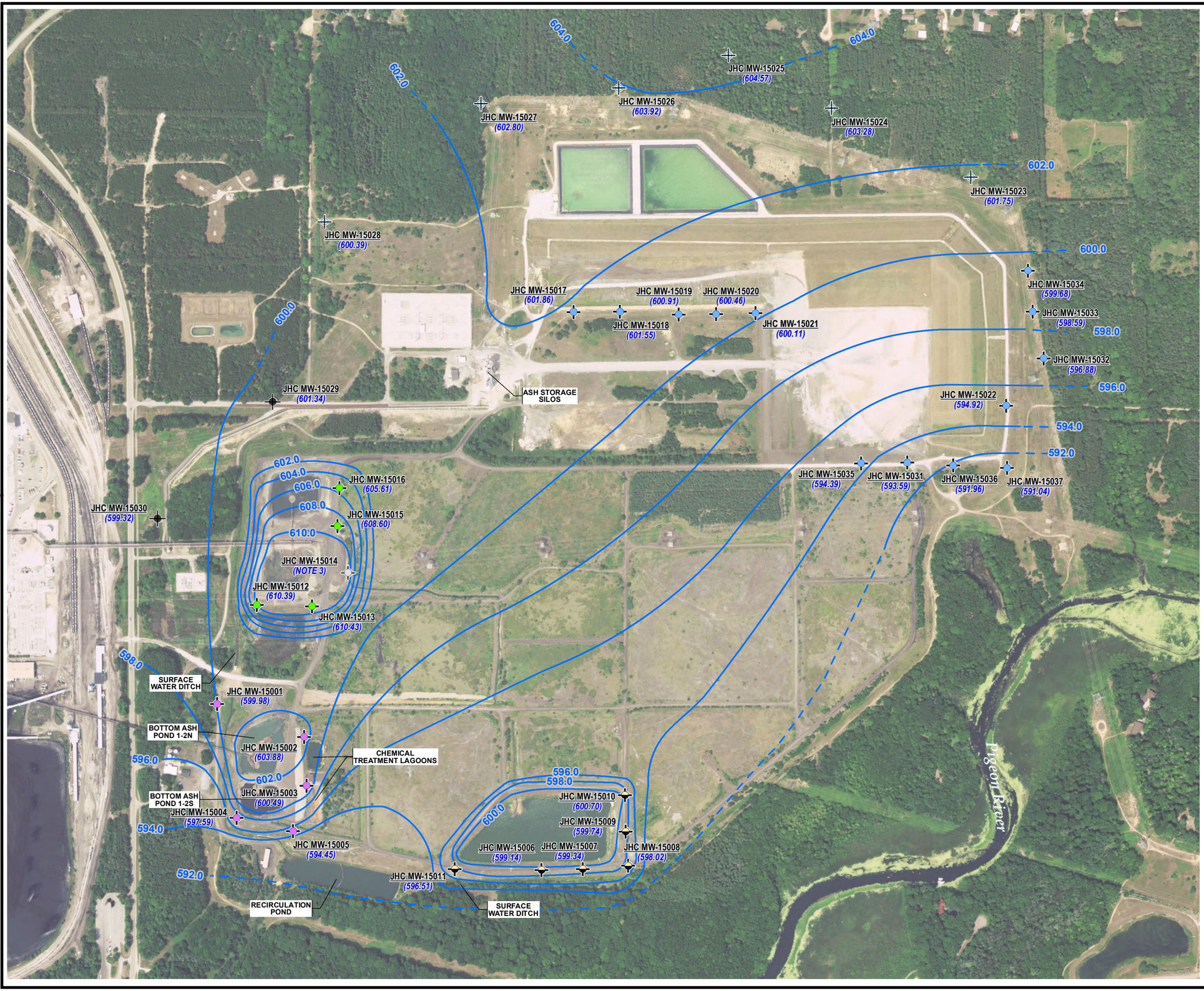

LEGEND

- BACKGROUND MONITORING WELL
- DECOMISSIONED MONITORING WELL
- DOWNGRADIENT BOTTOM ASH POND 1/2 N/S MONITORING WELL
- DOWNGRADIENT BOTTOM ASH POND 3 N/S MONITORING WELL
- DOWNGRADIENT LANDFILL MONITORING WELL
- MONITORING WELL (STATIC WATER LEVEL ONLY)
- POND A MONITORING WELL
- GROUNDWATER ELEVATION CONTOUR (2' INTERVAL, DASHED WHERE INFERRED)
- *(600.97)* GROUNDWATER ELEVATION (FEET)

NOTES

1. BASE MAP IMAGERY FROM USDAL-NATIONAL AGRICULTURE IMAGERY PROGRAM, 7/20/2016.
2. WELL LOCATIONS SURVEYED BY NEDERVELD ON 11/25/2015.
3. MONITORING WELL DECOMMISSIONED NOVEMBER 13, 2017.
4. GROUNDWATER ELEVATIONS DISPLAYED IN FEET RELATIVE TO THE NORTH AMERICAN VERTICAL DATUM OF 1988.

N

0 600 1,200 Feet

1 " = 600 '
1:7,200

PROJECT:
CONSUMERS ENERGY COMPANY
JH CAMPBELL POWER PLANT
WEST OLIVE, MICHIGAN

TITLE:
GROUNDWATER CONTOUR MAP SEPTEMBER 25, 2017

DRAWN BY:	S. MAJOR	PROJ NO.:	269767-001
CHECKED BY:	C. SCIESZKA		
APPROVED BY:	S. HOLMSTROM		
DATE:	JANUARY 2018		

FIGURE 2

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1540 Eisenhower Place
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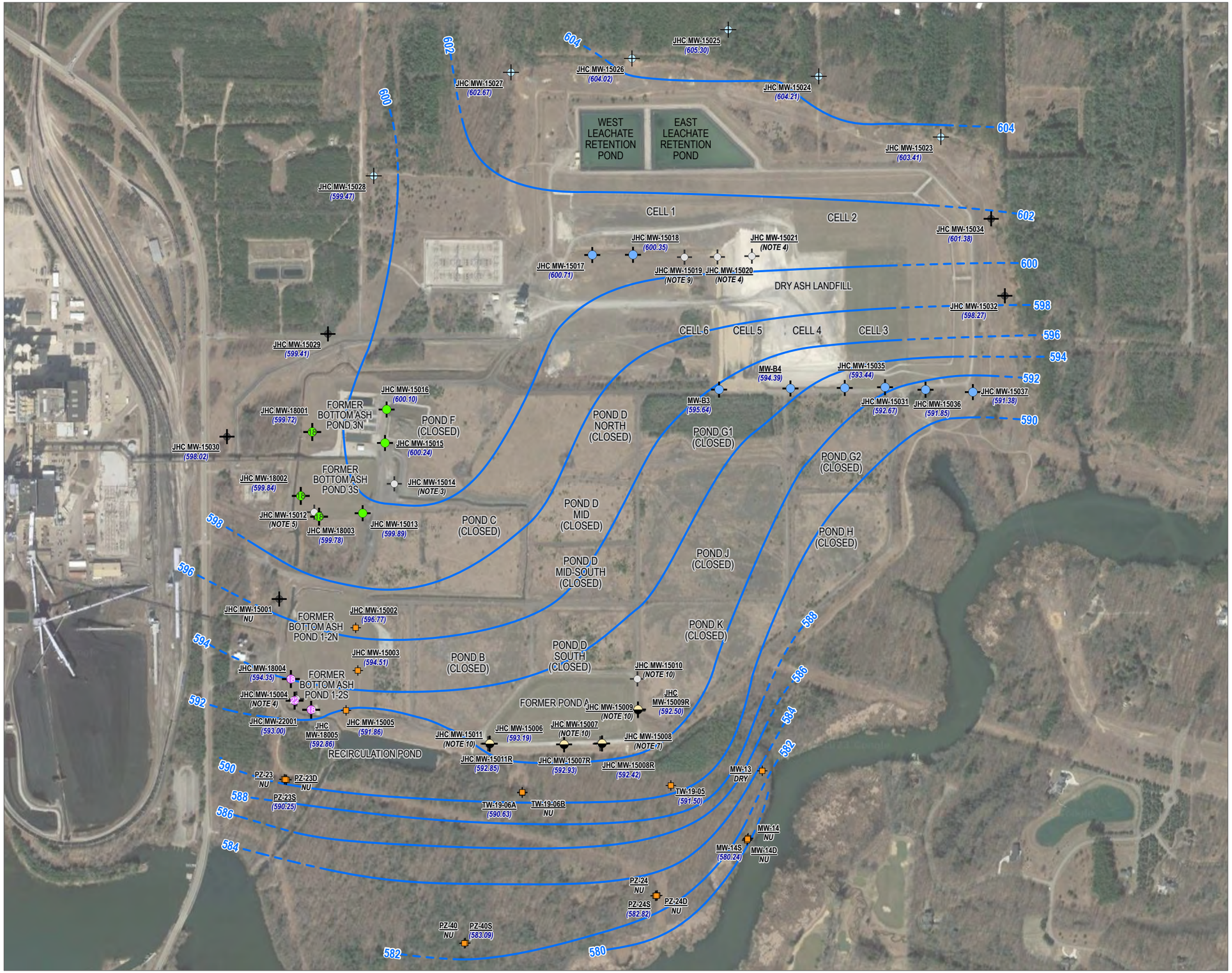

LEGEND

- BACKGROUND MONITORING WELL
- DOWNGRADIENT BOTTOM ASH POND 3 N/S MONITORING WELL
- DOWNGRADIENT LANDFILL MONITORING WELL
- DOWNGRADIENT POND A MONITORING WELL
- MONITORING WELL (STATIC WATER LEVEL ONLY)
- DECOMMISSIONED
- DOWNGRADIENT BOTTOM ASH POND 1/2 N/S MONITORING WELL (2018)
- DOWNGRADIENT BOTTOM ASH POND 1/2 N/S MONITORING WELL (2022)
- DOWNGRADIENT BOTTOM ASH POND 3 N/S MONITORING WELL (2018)
- NATURE AND EXTENT/DOWNGRADIENT MONITORING WELLS
- GROUNDWATER ELEVATION CONTOUR (2' INTERVAL, DASHED WHERE INFERRED)
- *NU* NOT USED/NOT APPLICABLE

NOTES:

1. BASE MAP IMAGERY FROM GOOGLE EARTH PRO, 2021.
2. WELL LOCATIONS BASED ON SURVEY DATA THROUGH JUNE 15, 2022.
3. MONITORING WELL DECOMMISSIONED NOVEMBER 13, 2017.
4. MONITORING WELL DECOMMISSIONED JUNE 14, 2018.
5. MONITORING WELL DECOMMISSIONED OCTOBER 10, 2018.
6. JHC-MW-1800X MONITORING WELLS INSTALLED IN DECEMBER 2018.
7. MONITORING WELL DECOMMISSIONED JUNE 24 , 2019.
8. JHC-MW-15008R AND TW-19-XX MONITORING WELLS INSTALLED IN JUNE 2019.
9. MONITORING WELLS DECOMMISSIONED MAY 25, 2021.
10. MONITORING WELLS DECOMMISSIONED AND REPLACED JULY 20-22, 2021.
11. JHC-MW-22001 MONITORING WELL INSTALLED MAY 12, 2022.
12. STATIC WATER ELEVATIONS IN NORTH AMERICAN VERTICAL DATUM 1988, NAVD 88.

1:8,400
1" = 700'
0 500 1,000 FEET

PROJECT: CONSUMERS ENERGY COMPANY
JH CAMPBELL POWER PLANT
WEST OLIVE, MICHIGAN

TITLE: GROUNDWATER CONTOUR MAP
APRIL 2023

DRAWN BY:	A. FOJTIK	PROJ. NO.:	514398.0000
CHECKED BY:	H. SCHNAIDT		FIGURE 3
APPROVED BY:	S. HOLMSTROM		
DATE:	JULY 2023		

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Coordinate System: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl; Map Rotation: 0
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LEGEND

- DOWNGRADIENT BOTTOM ASH POND 1/2 N/S MONITORING WELL
- NATURE AND EXTENT/DOWNGRADIENT MONITORING WELLS; DOWNGRADIENT BOTTOM ASH POND 1/2 N/S MONITORING WELL (2022); DOWNGRADIENT BOTTOM ASH POND 1/2 N/S MONITORING WELL (2018)
- NO STATISTICALLY SIGNIFICANT ARSENIC EXCEEDANCES
- STATISTICALLY SIGNIFICANT ARSENIC GWPS EXCEEDANCES

NOTES:

1. BASE MAP IMAGERY FROM GOOGLE EARTH PRO, APRIL 2016.

1:1,800
1" = 150'

0 150 300 FEET

PROJECT:
CONSUMERS ENERGY COMPANY
JH CAMPBELL POWER PLANT
WEST OLIVE, MICHIGAN

TITLE:
NATURE AND EXTENT SUMMARY ARSENIC GWPS EXCEEDANCES 2018

DRAWN BY:	A. FOJTIK	PROJ. NO.:	514398.0000
CHECKED BY:	H. SCHNAIDT		
APPROVED BY:	S. HOLMSTROM		**FIGURE 4**
DATE:	SEPTEMBER 2023		

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FILE: 464090_JHC.aprx

Coordinate System: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl - Map Rotation: 0
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LEGEND

- MONITORING WELL (STATIC WATER LEVEL ONLY)
- DECOMMISSIONED
- DOWNGRADIENT BOTTOM ASH POND 1/2 N/S MONITORING WELL (2018)
- DOWNGRADIENT BOTTOM ASH POND 1/2 N/S MONITORING WELL (2022)
- NATURE AND EXTENT/DOWNGRADIENT MONITORING WELLS
- NO STATISTICALLY SIGNIFICANT ARSENIC EXCEEDANCES
- STATISTICALLY SIGNIFICANT ARSENIC GWPS EXCEEDANCES
- POST-REMEDY GROUNDWATER FLOW DIRECTION

NOTES:

1. BASE MAP IMAGERY FROM GOOGLE EARTH PRO, MARCH 2021.

1:1,800
1" = 150'

0 150 300 FEET

PROJECT:
CONSUMERS ENERGY COMPANY
JH CAMPBELL POWER PLANT
WEST OLIVE, MICHIGAN

TITLE:
NATURE AND EXTENT SUMMARY
ARSENIC GWPS EXCEEDANCES 2023

DRAWN BY:	A. FOJTIK	PROJ. NO.:	514398.0000
CHECKED BY:	H. SCHNAIDT		
APPROVED BY:	S. HOLMSTROM		**FIGURE 5**
DATE:	SEPTEMBER 2023		

TRC
999 FOURIER DRIVE
SUITE 101
MADISON, WI 53717
PHONE: 608.826.3663

FILE: 464090_JHC.aprx

Attachment 1
CCR Removal Documentation Report
(Golder, August 2019)

J.H. Campbell Generating Facility

Bottom Ash Ponds 1-2 N/S CCR Removal Documentation Report

Submitted to:

Consumers Energy Company

1945 W. Parnall Road
Jackson, Michigan USA 49201

Submitted by:

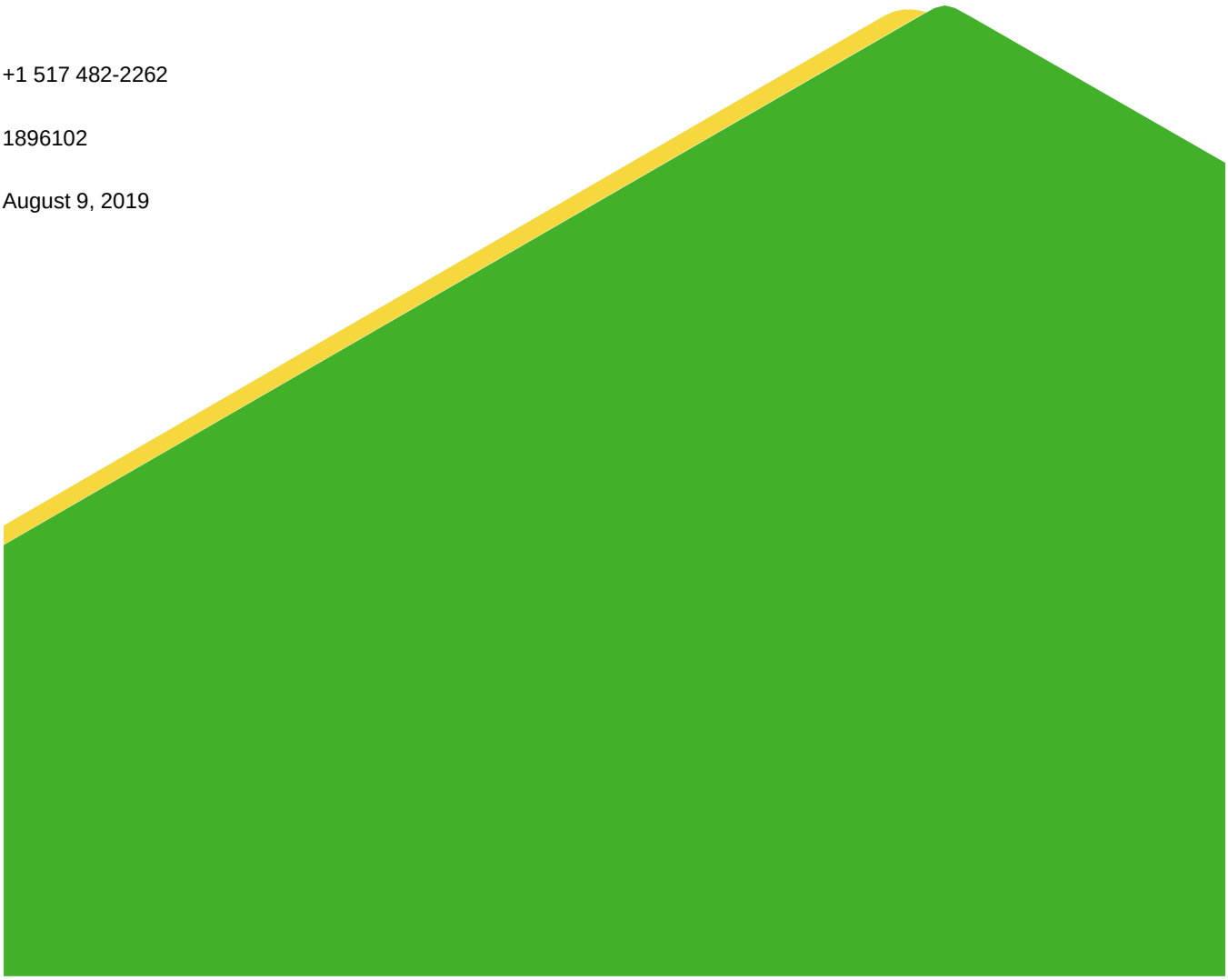
Golder Associates Inc.

15851 South US 27, Suite 50 Lansing, Michigan, USA 48906

+1 517 482-2262

1896102

August 9, 2019



CERTIFICATION

Professional Engineer Certification Statement

I hereby certify after having reviewed the attached documentation and being familiar with the *Consumers Energy J.H. Campbell Generating Facility Bottom Ash Ponds 1-2 Closure Work Plan* dated December 4, 2017 (Closure Work Plan) submitted to the Michigan Department of Environment, Great Lakes, and Energy (EGLE, formerly MDEQ) on December 5, 2017, 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

August 9, 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 Ponds 1-2 N/S (Ponds 1-2) CCR surface impoundment at the Consumers Energy Company's (CEC) J.H. Campbell Generating Facility (JH Campbell) located in West Olive, Michigan. This Report provides final verification of CCR removal from the entire Bottom Ash Ponds 1-2 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 1-2 Closure Work Plan dated December 4, 2017 (Closure Work Plan) submitted to the Michigan Department of Environment, Great Lakes, and Energy (EGLE, formerly MDEQ) on December 5, 2017. EGLE concurred with the Closure Work Plan in a letter dated February 26, 2018. This Report is being submitted to EGLE as a final certification that all solid waste has been removed from Bottom Ash Ponds 1-2.

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 Ponds 1-2 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 Ponds 1-2 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 Ponds 1-2 N/S CCR Removal Photo Log and **Appendix C**, Bottom Ash Ponds 1-2 N/S Grid Node Photographic Documentation Log provide photographic documentation of CCR removal. Photographed grid node locations are illustrated on **Figure 4**, Bottom Ash Ponds 1-2 N/S Photographed Grid Nodes.

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

  Table 1, Bottom Ash Ponds 1-2 N/S Colorimeter/Microscopy Results documents confirmation of CCR removal. Sampled grid node locations are illustrated on **Figure 5**, Bottom Ash Ponds 1-2 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 Ponds 1-2.

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

Table of Contents

1.0 INTRODUCTION

1.1 Purpose

Consumers Energy Company (CEC) identified Bottom Ash Ponds 1-2 N/S (Ponds 1-2) 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 1-2 Closure Work Plan* dated December 4, 2017 (Closure Work Plan). The Closure Work Plan was submitted to the Michigan Department of Environment Great Lakes, and Energy (EGLE, formerly MDEQ) on December 5, 2017; and EGLE concurred with the Closure Work Plan in a letter dated February 26, 2018. The Closure Work Plan was prepared to request agreement from EGLE on CEC's plan to close Bottom Ash Ponds 1-2 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 Ponds 1-2 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.

During excavation operations, CCR removal was documented based on the following three lines of evidence presented in the Closure Work Plan:

- 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 Ponds 1-2.

2.1 Narrative Description of CCR Removal

During August, September, and October 2018 Ryan Incorporated Central (Ryan) was retained by CEC to perform excavation activities to remove CCR from Bottom Ash Ponds 1-2. 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 Ponds 1-2 were 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 104 nodes was established across the limits of Bottom Ash Ponds 1-2.
- 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 Ponds 1-2. The subsurface investigations included the following boreholes, which are presented on **Figure 2** and recorded in **Appendix A**:

- JHC-BH-16005
- JHC-BH-16005A
- JHC-BH-16006
- JHC-BH-16007
- JHC-BH-16007A
- JHC-BH-16007B
- JHC-BH-16008

Visual observations for the presence of CCR were completed during excavation activities until CCR were no longer 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-16007B in Bottom Ash Ponds 1-2, where the excavation surface was 1.6 feet above the anticipated base of CCR. One three-foot-deep test pit (TP-

16007B) was conducted at this location during construction to confirm the CCR removal objective was met. The test pit log is included in **Appendix A**.

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 104 nodes was established across the limits of Bottom Ash Ponds 1-2 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 52 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 CCR or only trace amounts of CCR were observed, photographs and written descriptions were taken to document the material left in place at the 52 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 26 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 six grid nodes that were influenced by soils that did not match the site-specific colorimetric curve for Bottom Ash Ponds 1-2. CCR removal at the six grid nodes that did not pass colorimetric analysis was confirmed through microscopy, which is 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 #19. 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

Microscopy was used as an alternative to colorimetric analysis where soils on excavated surfaces did not match the site-specific colorimetric curve. Microscopy determined the darker materials noted in certain locations were due to the presence of silty and organic soils that were not consistent with the site-specific colorimetric curve.

The alternative third line of evidence was used to document CCR removal at the following six grid nodes where colorimetry analysis resulted in false-negatives.

- Grid Node #31
- Grid Node #36
- Grid Node #40R
- Grid Node #49R
- Grid Node #74
- Grid Node #103

Microscopy was used to document the third line of evidence at six grid nodes as illustrated on **Figure 5** and 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 December 5, 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 Ponds 1-2 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 Ponds 1-2.

This Report has been prepared to document the removal of solid waste from Bottom Ash Ponds 1-2 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
Ponds 1-2 N/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	-1300.00	1909.28	8/27/2018	10980713	3.47	-	**Pass**
3[(b)]	-1250.00	1907.36	8/27/2018	11638385	0.00	-	**Pass**
10[(b)]	-900.00	1928.57	8/31/2018	11836798	0.00	-	**Pass**
11	-1385.30	1950.00	8/27/2018	11244403	0.97	-	**Pass**
13[(b)]	-1300.00	1950.00	8/27/2018	11440748	0.00	-	**Pass**
19	-1000.00	1950.00	9/10/2018	10584408	8.87	-	**Fail**
19R(a)				10847063	5.08	-	**Pass**
19R(b)				10912856	4.26	-	
19R(c)				11044184	2.79	-	
19R(d)				10978648	3.50	-	
19R Average[(c)]				10945688	3.87	-	
26	-1250.00	2000.00	8/27/2018	9665885	28.90	-	**Fail**
26R			8/29/2018	11112558	2.11	-	**Pass**
30[(b)]	-1050.00	2000.00	8/28/2018	11572077	0.00	-	**Pass**
31[(d)]	-1000.00	2000.00	8/31/2018	10517840	(a)	1.0	**Pass**
36[(d)]	-1400.00	2050.00	8/27/2018	10388579	(a)	0.5	**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): Microscopy analysis was determined to be the most accurate method for testing of CCR percentages for samples with a darker base color than the base sample used for the generation of Ponds 1-2 colorimeteric curve.
R: Designates a retest sample collected at the same Northing and Easting of original sample after additional material was removed from a 100 by 100 foot area about the node.

CEC J.H. Campbell
Ponds 1-2 N/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%)**
40[(d)]	-1200.00	2050.00	8/27/2018	10582345	8.91	-	**Fail**
40R[(d)]			8/29/2018	10846806	(a)	< 1.0	**Pass**
42	-1100.00	2050.00	8/27/2018	10914148	4.24	-	**Pass**
46[(b)]	-900.00	2050.00	8/31/2018	11574140	0.00	-	**Pass**
49[(d)]	-765.34	2050.00	8/31/2018	10059871	19.02	-	**Fail**
49R[(d)]	-765.34	2050.00	9/4/2018	9796443	(a)	2.0	**Pass**
51	-1350.00	2100.00	8/27/2018	11112301	2.11	-	**Pass**
52	-1300.00	2100.00	8/27/2018	11243886	0.97	-	**Pass**
54[(b)]	-1200.00	2100.00	8/27/2018	11573367.00	0.00	-	**Pass**
57	-1050.00	2100.00	8/28/2018	10979681	3.49	-	**Pass**
64	-1376.80	2150.00	8/27/2018	11047281	2.76	-	**Pass**
71	-1050.00	2150.00	8/28/2018	9929060	22.09	-	**Fail**
71R[(b)]			8/29/2018	11638129	0.00	-	**Pass**
72	-1000.00	2150.00	8/28/2018	11374957	0.04	-	**Pass**
74[(d)]	-900.00	2150.00	9/6/2018	10455401	(a)	1.0	**Pass**
78	-1368.72	2200.00	8/27/2018	11375214	0.04	-	**Pass**
93	-1300.00	2243.00	8/27/2018	11177578	1.52	-	**Pass**
95[(b)]	-1200.00	2231.00	8/27/2018	11440749	0.00	-	**Pass**
103[(d)]	-800.00	2228.33	9/7/2018	10521192	(a)	< 0.5	**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.

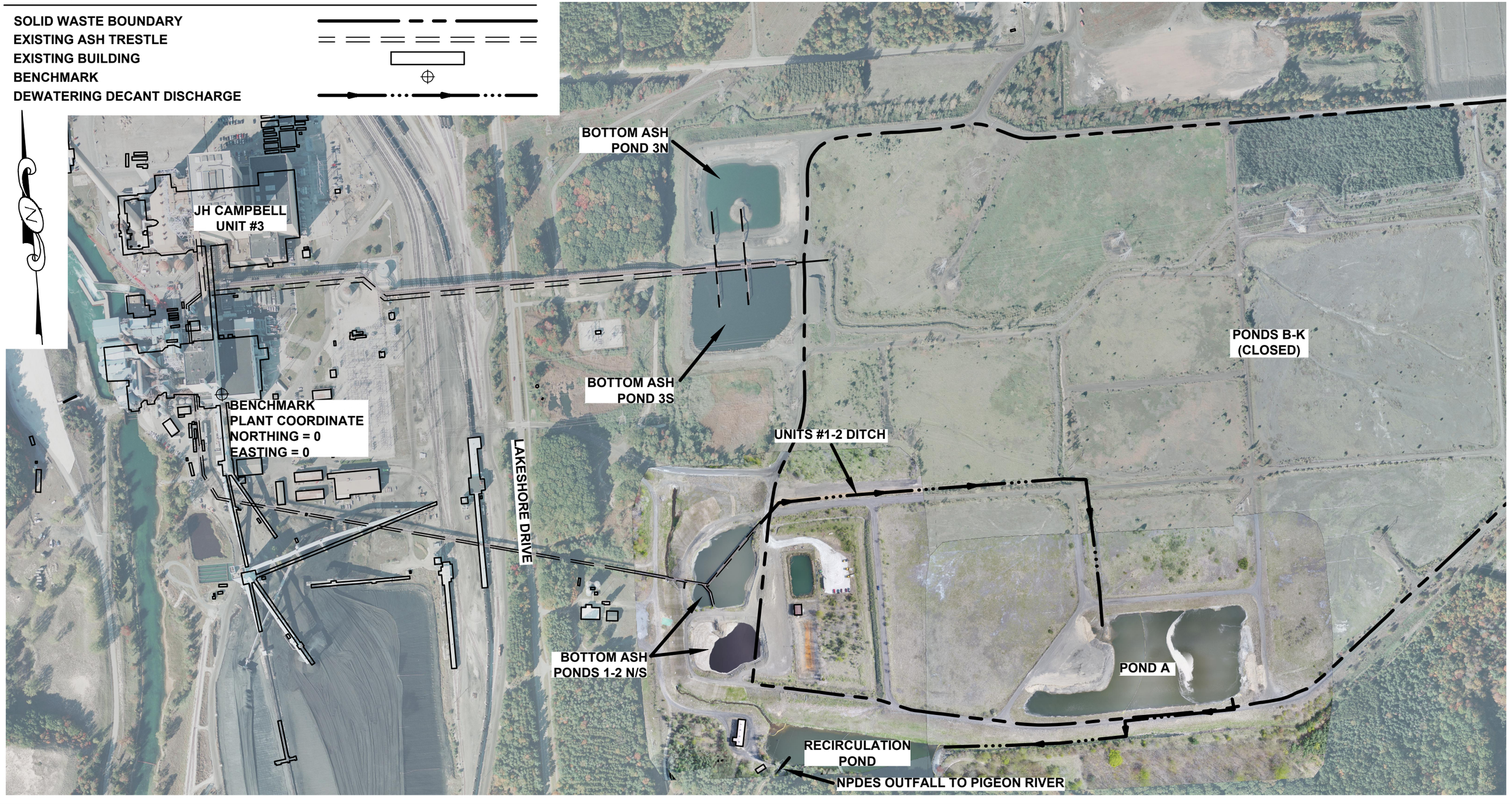
(d): Microscopy analysis was determined to be the most accurate method for testing of CCR percentages for samples with a darker base color than the base sample used for the generation of Ponds 1-2 colorimeteric curve.

R: Designates a retest sample collected at the same Northing and Easting of original sample after additional material was removed from a 100 by 100 foot area about the node.

Figures

LEGEND

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



REV	DATE	DESCRIPTION	BY	CHK	APP
	08-09-19	ISSUED FOR FINAL REPORT	SSF	HAD	MAB

SIGNATURE

NAME

MICHIGAN P.E. NO.

Consumers Energy

J.H. CAMPBELL ASH STORAGE FACILITY

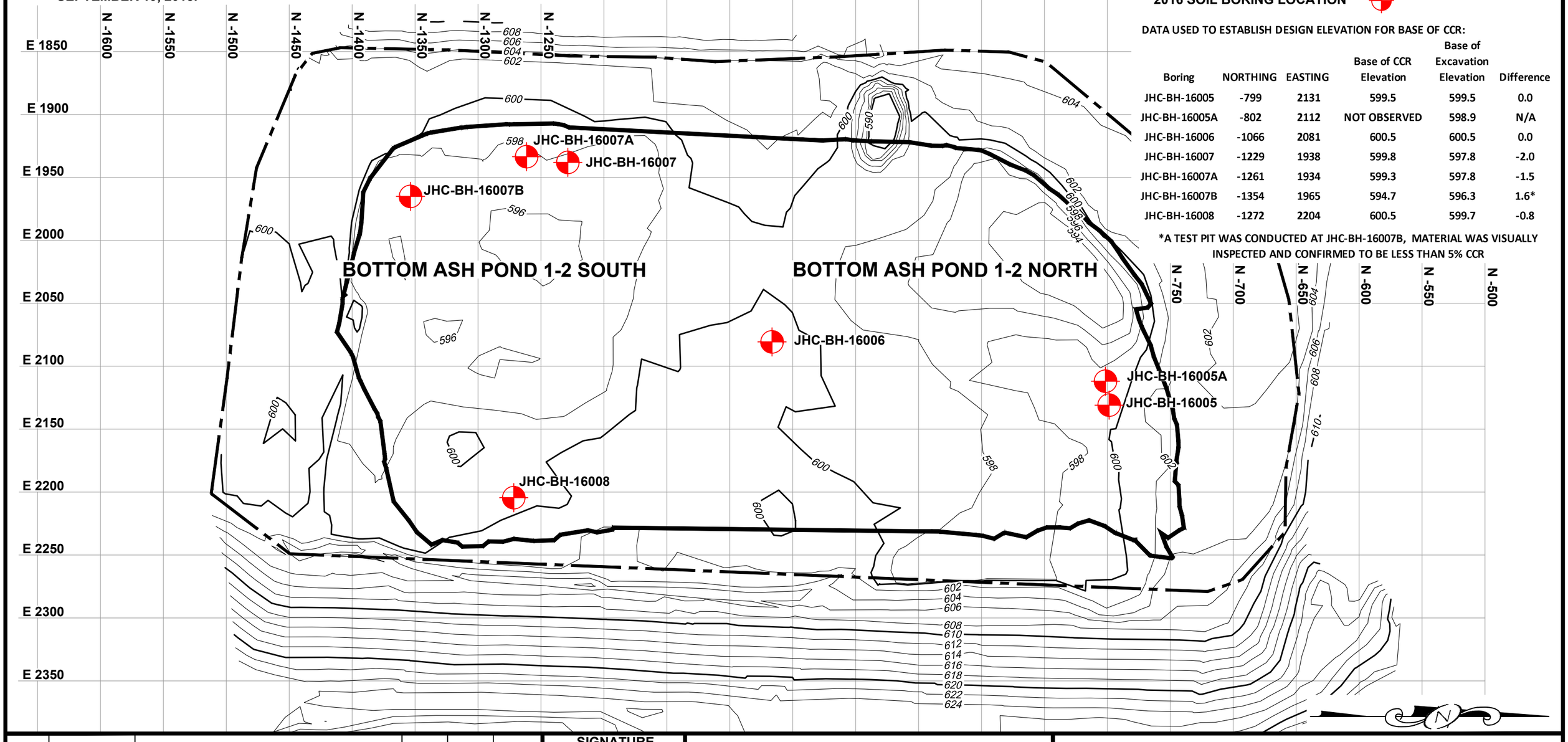
JH CAMPBELL BOTTOM ASH PONDS 1-2 N/S

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 ARE ON THE J.H. CAMPBELL LOCAL PLANT DATUM (NGVD 29).
3. EXCAVATED CONTOURS SHOWN ARE FROM THE POST-EXCAVATION SURVEY DATA PROVIDED BY RYAN INCORPORATED CENTRAL ON SEPTEMBER 19, 2018.



LEGEND

- WORKPLAN EXCAVATION BOUNDARY
- POND WETTED BOUNDARY
- MAJOR CONTOUR
- MINOR CONTOUR
- 2016 SOIL BORING LOCATION

DATA USED TO ESTABLISH DESIGN ELEVATION FOR BASE OF CCR:

Boring	NORTHING	EASTING	Base of CCR Elevation	Base of Excavation Elevation	Difference
JHC-BH-16005	-799	2131	599.5	599.5	0.0
JHC-BH-16005A	-802	2112	NOT OBSERVED	598.9	N/A
JHC-BH-16006	-1066	2081	600.5	600.5	0.0
JHC-BH-16007	-1229	1938	599.8	597.8	-2.0
JHC-BH-16007A	-1261	1934	599.3	597.8	-1.5
JHC-BH-16007B	-1354	1965	594.7	596.3	1.6*
JHC-BH-16008	-1272	2204	600.5	599.7	-0.8

*A TEST PIT WAS CONDUCTED AT JHC-BH-16007B, MATERIAL WAS VISUALLY INSPECTED AND CONFIRMED TO BE LESS THAN 5% CCR

REV	DATE	DESCRIPTION	BY	CHK	APP
	08-09-19	ISSUED FOR FINAL REPORT	SSF	HAD	MAB

SIGNATURE

NAME

MICHIGAN P.E. NO.

Consumers Energy

J.H. CAMPBELL ASH STORAGE FACILITY

JH CAMPBELL BOTTOM ASH PONDS 1-2 N/S

CCR REMOVAL DOCUMENTATION - EXCAVATION SURFACE

SCALE	1" = 75'	DRAWING NO.	FIGURE	REV.
JOB			2	

NOTES

1. COORDINATES SHOWN ARE ON THE J.H. CAMPBELL LOCAL PLANT DATUM
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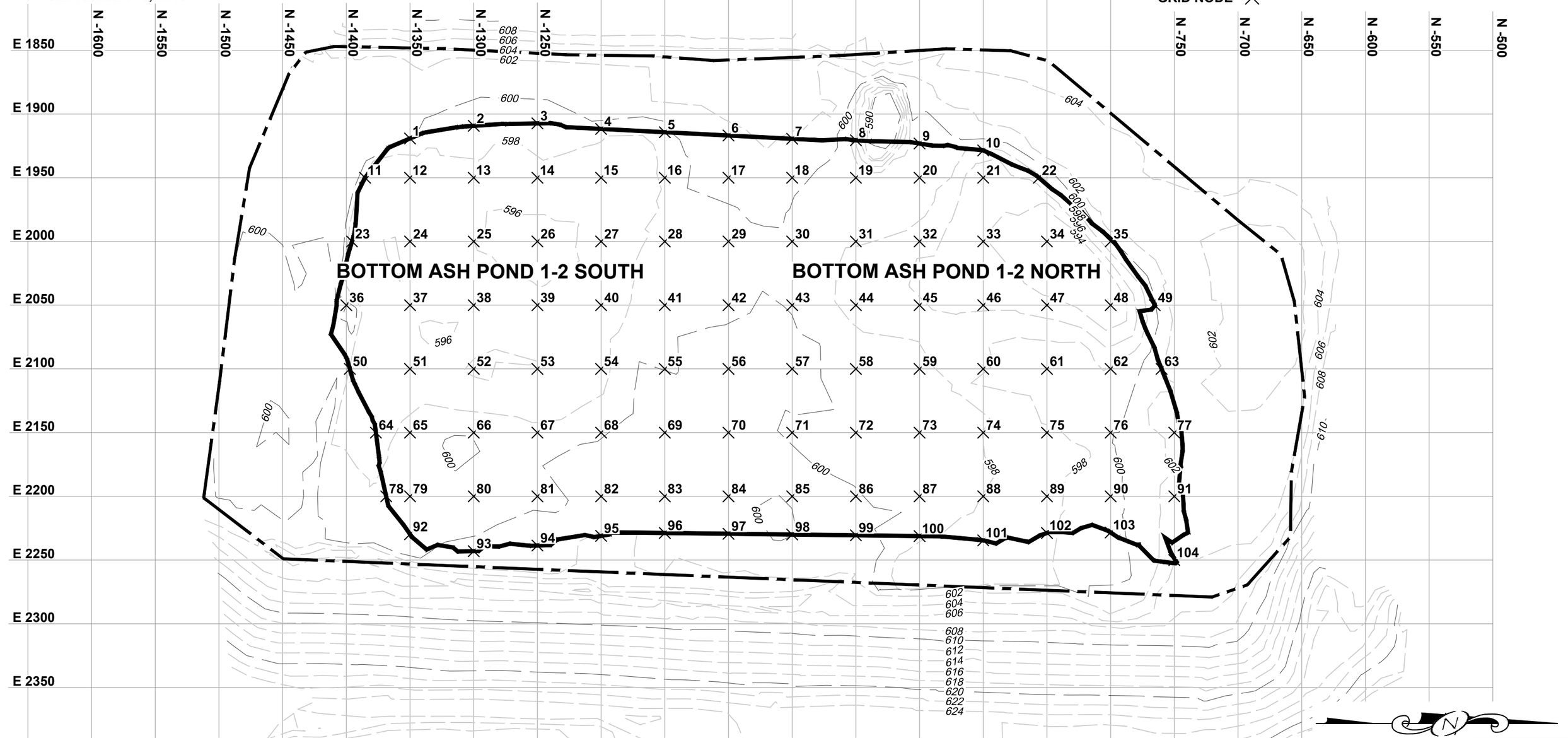
3. EXCAVATED CONTOURS SHOWN ARE FROM THE POST-EXCAVATION SURVEY DATA PROVIDED BY RYAN INCORPORATED CENTRAL ON SEPTEMBER 19, 2018.

LEGEND

- WORKPLAN EXCAVATION BOUNDARY
- POND WETTED BOUNDARY
- MAJOR CONTOUR
- MINOR CONTOUR
- GRID NODE 22



REV	DATE	DESCRIPTION	BY	CHK	APP
	08-09-19	ISSUED FOR FINAL REPORT	SSF	HAD	MAB

SIGNATURE

NAME

MICHIGAN P.E. NO.

Consumers Energy

J.H. CAMPBELL ASH STORAGE FACILITY

JH CAMPBELL BOTTOM ASH PONDS 1-2 N/S

CCR REMOVAL DOCUMENTATION - SAMPLE GRID NODES

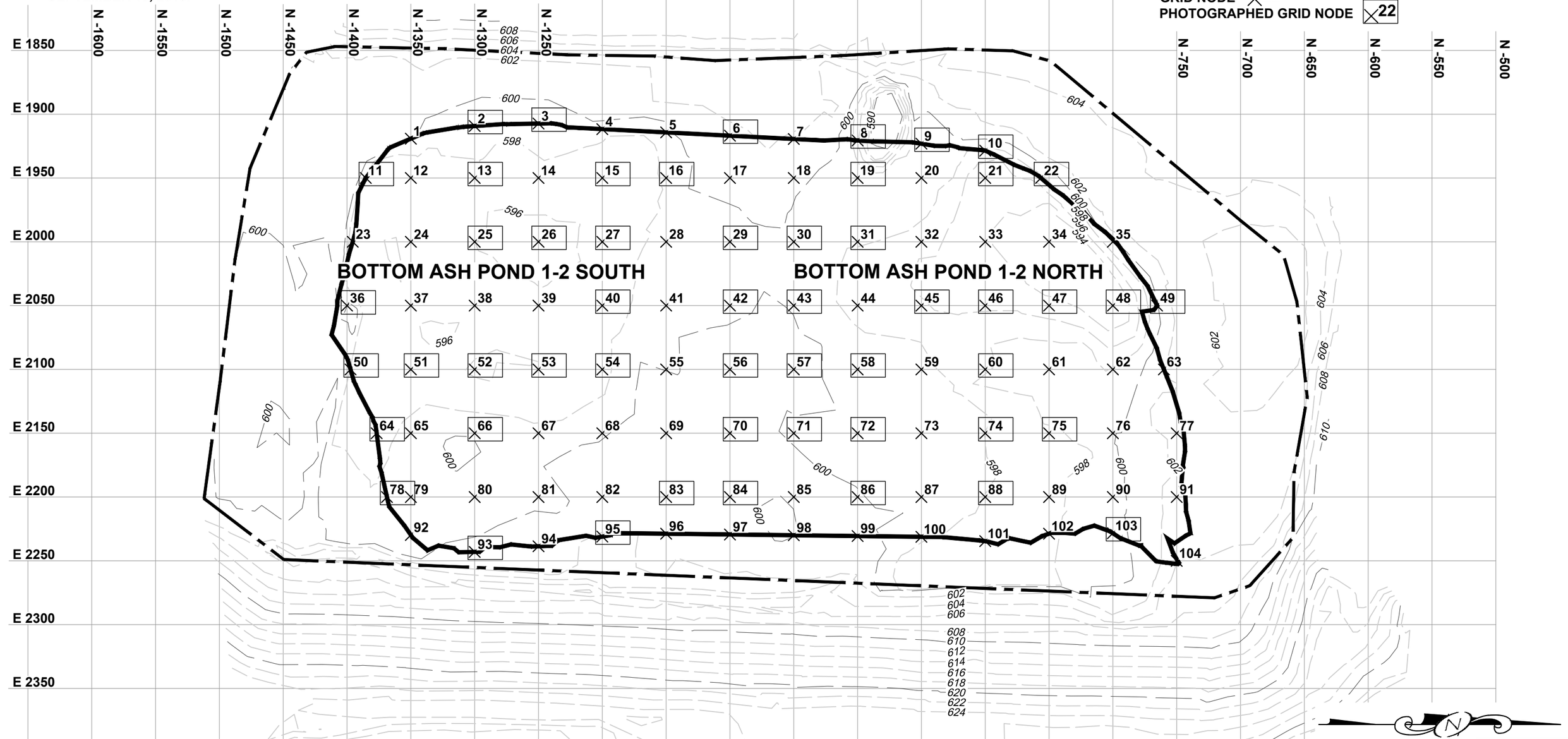
SCALE	1" = 75'	DRAWING NO.	FIGURE	REV.
JOB			3	

NOTES

1. COORDINATES SHOWN ARE ON THE J.H. CAMPBELL LOCAL PLANT DATUM
2. ELEVATIONS ARE ON THE J.H. CAMPBELL LOCAL PLANT DATUM (NGVD 29).
3. EXCAVATED CONTOURS SHOWN ARE FROM THE POST-EXCAVATION SURVEY DATA PROVIDED BY RYAN INCORPORATED CENTRAL ON SEPTEMBER 19, 2018.

LEGEND

- WORKPLAN EXCAVATION BOUNDARY
- POND WETTED BOUNDARY
- MAJOR CONTOUR
- MINOR CONTOUR
- GRID NODE 22
- PHOTOGRAPHED GRID NODE 22



REV	DATE	DESCRIPTION	BY	CHK	APP
	08-09-19	ISSUED FOR FINAL REPORT	SSF	HAD	MAB

SIGNATURE

NAME

MICHIGAN P.E. NO.

Consumers Energy

J.H. CAMPBELL ASH STORAGE FACILITY

JH CAMPBELL BOTTOM ASH PONDS 1-2 N/S

CCR REMOVAL DOCUMENTATION - PHOTOGRAPHED GRID NODES

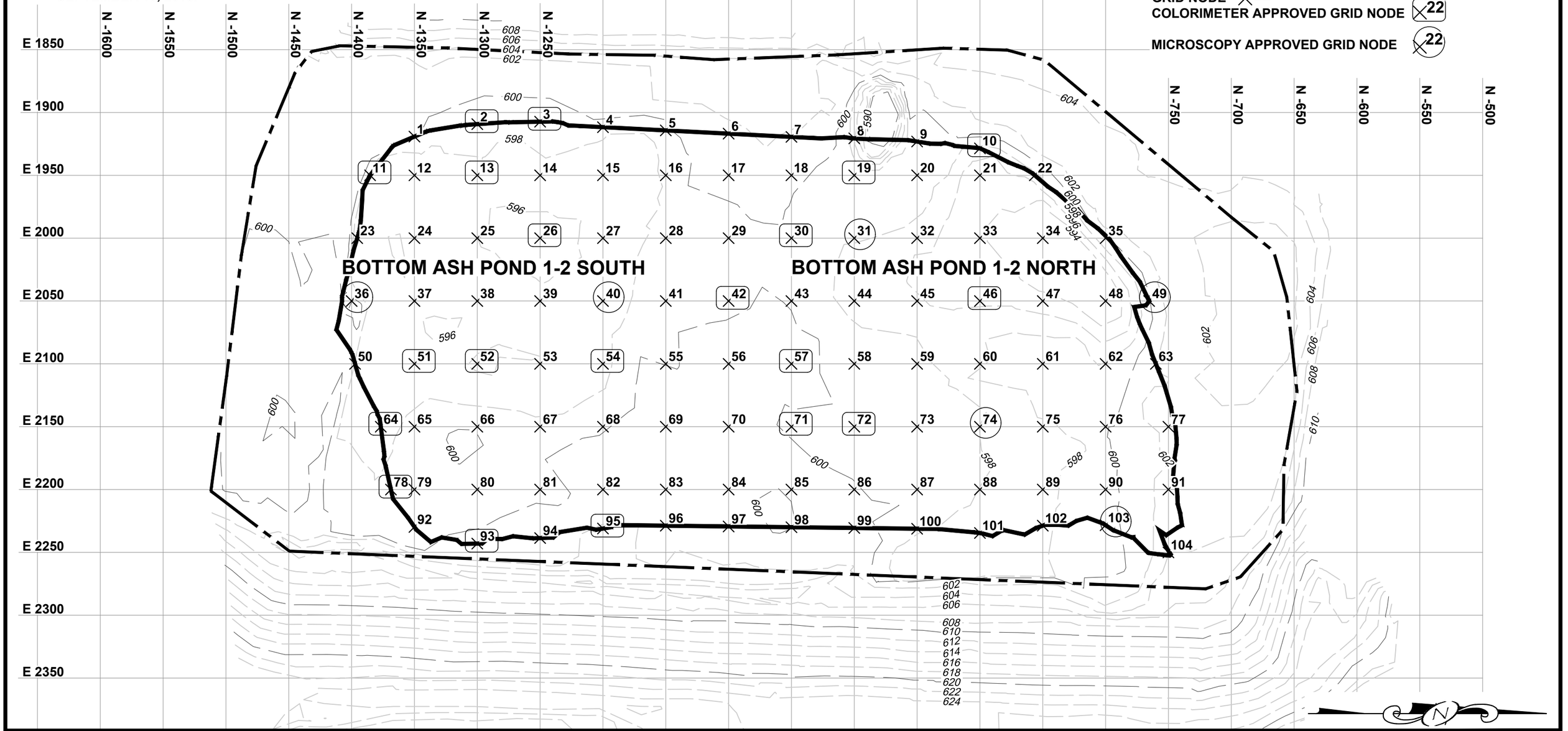
SCALE	1" = 75'	DRAWING NO.	FIGURE	REV.
JOB			4	

NOTES

1. COORDINATES SHOWN ARE ON THE J.H. CAMPBELL LOCAL PLANT DATUM
2. ELEVATIONS ARE ON THE J.H. CAMPBELL LOCAL PLANT DATUM (NGVD 29).
3. EXCAVATED CONTOURS SHOWN ARE FROM THE POST-EXCAVATION SURVEY DATA PROVIDED BY RYAN INCORPORATED CENTRAL ON SEPTEMBER 19, 2018.

LEGEND

- WORKPLAN EXCAVATION BOUNDARY
- POND WETTED BOUNDARY
- MAJOR CONTOUR
- MINOR CONTOUR
- GRID NODE 22
- COLORIMETER APPROVED GRID NODE 22
- MICROSCOPY APPROVED GRID NODE 22



REV	DATE	DESCRIPTION	BY	CHK	APP
	08-09-19	ISSUED FOR FINAL REPORT	SSF	HAD	MAB

SIGNATURE

NAME

MICHIGAN P.E. NO.

Consumers Energy

J.H. CAMPBELL ASH STORAGE FACILITY

JH CAMPBELL BOTTOM ASH PONDS 1-2 N/S

CCR REMOVAL DOCUMENTATION -

COLORIMETER/MICROSCOPY CONFIRMATION GRID NODES

SCALE	1" = 75'	DRAWING NO.	FIGURE	REV.
JOB			5	

APPENDIX A

Subsurface Investigation Data

RECORD OF BOREHOLE JHC-BH-16005

SHEET 1 of 1

PROJECT: JH Campbell Ash Ponds
PROJECT NUMBER: 1654923
LOCATION: N end of Unit 1/2 N Pond
CLIENT: Consumers

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

DATUM: NGVD29
AZIMUTH: ---
NAD83 MI PLANE-S COORDS: N 518452.6, E 12633735

GS ELEVATION (ft): 605.6
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 - 5.1 WATER.			600.5								
5		5.1 - 6.1 (CCR) COAL COMBUSTION RESIDUALS, black, wet, soft.			5.1 599.5			1 2 3	SONIC SONIC SONIC		● ● ●	●	
		6.1 - 10.1 (SP) SAND, poorly graded, medium to fine, trace gravel and fines, brown, non-cohesive, wet, loose to compact.	SP		6.1 595.5	1	5.00 5.00						
10		10.1 - 15.1 (SP) No recovery, assumed to be SAND.	SP		10.1 590.5	2	0.00 5.00						
15		Boring completed at 15.1 ft.											
20		NOTES: 1. Drilled from a barge. 2. Mud line at a depth of 5.1 feet.											
25													
30													
35													
40													

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

LOGGED: MMJ
CHECKED: JRP
DATE: 6/4/2017

Golder Associates

DUL_BOREHOLE (BC ASH POND) 1654923 JH CAMPBELL ASH PONDS_20160715.GPJ DUL.GOLDER.GDT 6/6/17

RECORD OF BOREHOLE JHC-BH-16005A

SHEET 1 of 1

PROJECT: JH Campbell Ash Ponds
PROJECT NUMBER: 1654923
LOCATION: N end of Unit 1/2 N Pond
CLIENT: Consumers

DRILLING METHOD: Sonic
DRILLING DATE: 5-19-16
DRILL RIG: Sonic

DATUM: NGVD29
AZIMUTH: ---
NAD83 MI PLANE-S COORDS: N 518449.4, E 12633716

GS ELEVATION (ft): 605.6
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	Direct push	0.0 - 5.2 WATER.			600.4								
5	Direct push	5.2 - 10.2 No recovery, see JHC-BH-16005 for lithology.			5.2 595.4								
10	Sonic	10.2 - 18.2 (SP) SAND, poorly graded, medium to fine, trace gravel and fines, brown, non-cohesive, wet, loose to compact.	SP		10.2	1	3.00 3.00	1	SONIC		●		
15	Sonic		SP			2	5.00 5.00	2	SONIC		●		
					587.4								
20		Boring completed at 18.2 ft. NOTES: 1. Drilled from a barge. 2. Mud line at a depth of 5.2 feet. 3. Re-attempt of boring JHC-BH-16005. Barge was relocated approximately 10 feet west of JHC-BH-16005.											
25													
30													
35													
40													

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

LOGGED: MMJ
CHECKED: JRP
DATE: 6/4/2017

Golder Associates

DUL_BOREHOLE (BC ASH POND) 1654923 JH CAMPBELL ASH PONDS_20160715.GPJ DUL.GOLDER.GDT 6/6/17

RECORD OF BOREHOLE JHC-BH-16006

SHEET 1 of 1

PROJECT: JH Campbell Ash Ponds
PROJECT NUMBER: 1654923
LOCATION: S end of Unit 1/2 N Pond
CLIENT: Consumers

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

DATUM: NGVD29
AZIMUTH: ---
NAD83 MI PLANE-S COORDS: N 518183.9, E 12633689

GS ELEVATION (ft): 605.6
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 - 4.1 WATER.			601.5								
5		4.1 - 5.1 (CCR) COAL COMBUSTION RESIDUALS, black, wet, soft.			4.1 600.5			1	SONIC		●		
		5.1 - 19.1 (SP) SAND, poorly graded, medium to fine, trace gravel and fines, brown, non-cohesive, wet, loose to compact.	SP		5.1	1	2.00 5.00	2	SONIC		●		
10						2	5.00 5.00	3	SONIC		●	●	
								4	SONIC		●		
15						3	3.00 5.00						
					586.5								
20		Boring completed at 19.1 ft. NOTES: 1. Drilled from a barge. 2. Mud line at a depth of 4.1 feet.											
25													
30													
35													
40													

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

LOGGED: MMJ
CHECKED: JRP
DATE: 6/4/6017

Golder Associates

DUL_BOREHOLE (BC ASH POND) 1654923 JH CAMPBELL ASH PONDS_20160715.GPJ DUL.GOLDER.GDT 6/6/17

RECORD OF BOREHOLE JHC-BH-16007

SHEET 1 of 1

PROJECT: JH Campbell Ash Ponds
PROJECT NUMBER: 1654923
LOCATION: W end of Unit 1/2 S Pond
CLIENT: Consumers

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

DATUM: NGVD29
AZIMUTH: ---
NAD83 MI PLANE-S COORDS: N 518019.3, E 12633549

GS ELEVATION (ft): 614.9
TOC ELEVATION: ---

DEPTH (ft)	BORING METHOD	SOIL PROFILE: DESCRIPTION / VEGETATION:	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	RUN: NUMBER	RUN: REC / ATT	SAMPLES: NUMBER	SAMPLES: TYPE	POCKET PENETROMETER (tons/ft²)	LAB TESTS: ENVIRONMENTAL (SPLP & TOTAL METALS)	LAB TESTS: GRAIN SIZE DISTRIBUTION	NOTES WATER LEVELS
0	Sonic	0.0 - 7.1 WATER.			607.8								
		7.1 - 10.7 (CCR) COAL COMBUSTION RESIDUALS, black to dark gray, wet, soft.			7.1			1	SONIC		●	●	
10					604.2	1	5.00 / 5.00	2	SONIC		●		
		10.7 - 12.1 (SP) SAND, poorly graded, fine, trace to some CCR, trace gravel brown, non-cohesive, wet, loose.	SP		10.7 602.8			3	SONIC		●	●	
		12.1 - 15.1 (CCR) COAL COMBUSTION RESIDUALS, dark gray, wet, soft to firm.			12.1	2	2.50 / 3.00						
15					599.8			4	SONIC		●		
		Boring completed at 15.1 ft.											
20		NOTES: 1. Drilled from a barge. 2. Mud line at a depth of 7.1 feet. 3. Unable to recover material below 15.1 feet. Drillers were able to advance casing; however, material was not entering the casing and sample liner. There may have been a buried boulder too large to enter the casing or the material below 15.1 feet was unable to displace sampled material already present in the casing.											
25													
30													
35													
40													

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

LOGGED: MMJ
CHECKED: JRP
DATE: 6/4/2017

Golder Associates

DUL_BOREHOLE (BC ASH POND) 1654923 JH CAMPBELL ASH PONDS_20160715.GPJ DUL.GOLDER.GDT 6/6/17

RECORD OF BOREHOLE JHC-BH-16007A

SHEET 1 of 1

PROJECT: JH Campbell Ash Ponds
PROJECT NUMBER: 1654923
LOCATION: W end of Unit 1/2 S Pond
CLIENT: Consumers

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

DATUM: NGVD29
AZIMUTH: ---
NAD83 MI PLANE-S COORDS: N 517986.5, E 12633545

GS ELEVATION (ft): 614.9
TOC ELEVATION: ---

DEPTH (ft)	BORING METHOD	SOIL PROFILE: DESCRIPTION / VEGETATION:	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	RUN: NUMBER	RUN: REC / ATT	SAMPLES: NUMBER	SAMPLES: TYPE	POCKET PENETROMETER (tons/ft²)	LAB TESTS: ENVIRONMENTAL (SPLP & TOTAL METALS)	LAB TESTS: GRAIN SIZE DISTRIBUTION	NOTES WATER LEVELS
0	Direct push	0.0 - 7.1 WATER.			607.8								
		7.1 - 13.8 No recovery, see JHC-BH-16007 for lithology.			7.1 601.1								
15	Sonic	13.8 - 15.6 (CCR) COAL COMBUSTION RESIDUALS, black to dark gray, wet, soft.			13.8 599.3	1	4.00 4.00	1	SONIC		●	●	
		15.6 - 17.8 (SP) SAND, poorly graded, medium to fine, trace fines, brown, non-cohesive, wet, loose to compact.	SP		15.6 597.1			2	SONIC		●		
20		Boring completed at 17.8 ft.											
25		NOTES: 1. Drilled from a barge. 2. Mud line at a depth of 7.1 feet. 3. Re-attempt of boring JHC-BH-16007. Barge was relocated approximately 5 to 10 feet south of JHC-BH-16007. 4. Unable to recover material below 17.8 feet. Encountered similar conditions as JHC-BH-16007. Drillers suspect the material below 17.8 feet was unable to displace sampled material already present in the casing.											
30													
35													
40													

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

LOGGED: MMJ
CHECKED: JRP
DATE: 6/4/2017

Golder Associates

DUL_BOREHOLE (BC ASH POND) 1654923 JH CAMPBELL ASH PONDS_20160715.GPJ DUL.GOLDER.GDT 6/6/17

RECORD OF BOREHOLE JHC-BH-16007B

SHEET 1 of 1

PROJECT: JH Campbell Ash Ponds
PROJECT NUMBER: 1654923
LOCATION: W end of Unit 1/2 S Pond
CLIENT: Consumers

DRILLING METHOD: Sonic
DRILLING DATE: 5-19-16
DRILL RIG: Sonic

DATUM: NGVD29
AZIMUTH: ---
NAD83 MI PLANE-S COORDS: N 517894.7, E 12633578

GS ELEVATION (ft): 614.9
TOC ELEVATION: ---

DEPTH (ft)	BORING METHOD	SOIL PROFILE: DESCRIPTION / VEGETATION:	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	RUN: NUMBER	RUN: REC / ATT	SAMPLES: NUMBER	SAMPLES: TYPE	POCKET PENETROMETER (tons/ft²)	LAB TESTS: ENVIRONMENTAL (SPLP & TOTAL METALS)	LAB TESTS: GRAIN SIZE DISTRIBUTION	NOTES WATER LEVELS
0	Direct push	0.0 - 7.0 WATER.			607.9								
		7.0 - 12.0 No recovery, see JHC-BH-16007 for lithology.			7.0 602.9								
10	Sonic	12.0 - 16.0 (SP) SAND, poorly graded, fine, trace to some CCR, trace gravel, brown, non-cohesive, wet, loose.	SP		12.0 598.9	1	4.00 4.00						
15		16.0 - 18.2 (CCR) COAL COMBUSTION RESIDUALS, black, wet, soft.			16.0 596.7			1	SONIC		●		
		18.2 - 20.2 (CCR) COAL COMBUSTION RESIDUALS with SAND, dark grayish brown, wet, loose.			18.2 594.7	2	5.00 5.00						
20		20.2 - 26.0 (SP) SAND, poorly graded, medium to fine, trace fines, brown, non-cohesive, wet, loose to compact.	SP		20.2 588.9	3	2.00 5.00	2	SONIC		●	●	
25		Boring completed at 26.0 ft. NOTES: 1. Drilled from a barge. 2. Mud line at a depth of 7.0 feet. 3. Re-attempt of boring JHC-BH-16007. Barge was relocated approximately 20 feet south of JHC-BH-16007.											
30													
35													
40													

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

LOGGED: MMJ
CHECKED: JRP
DATE: 6/4/2017

Golder Associates

DUL_BOREHOLE (BC ASH POND) 1654923 JH CAMPBELL ASH PONDS_20160715.GPJ DUL.GOLDER.GDT 6/6/17

RECORD OF TEST PIT TP-16007B

SHEET 1 of 1

PROJECT: JHC Pond Closures
PROJECT NUMBER: 1896102
LOCATION: Pond 1-2 S
CLIENT: CEC

EXCAVATION DATE: 8-27-18
EQUIPMENT: Shovel

DATUM: NGVD29
COORDS: N: -1,354 E: 1,965

GS ELEVATION (ft): 597.31

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 - 3.0 (SP) SAND, poorly graded, fine to medium, light brown.	SP		594.3					
	Boring completed at 3.0 ft.								
5	NOTES: 1. Coordinates provided in plant datum.								
10									

DEPTH SCALE:1 in to 1.3 ft
DRILLING CONTRACTOR: Golder
DRILLER: HD

LOGGED: HD
CHECKED: JRP
DATE: 7/16/2019

Figure
TP-16007B

DUL_TESTPIT POND CLOSURE.GPJ GLDR_ANC.GDT 7/16/19

RECORD OF BOREHOLE JHC-BH-16008

SHEET 1 of 1

PROJECT: JH Campbell Ash Ponds
PROJECT NUMBER: 1654923
LOCATION: E end of Unit 1/2 S Pond
CLIENT: Consumers

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

DATUM: NGVD29
AZIMUTH: ---
NAD83 MI PLANE-S COORDS: N 517980.6, E 12633816

GS ELEVATION (ft): 614.9
TOC ELEVATION: ---

DEPTH (ft)	BORING METHOD	SOIL PROFILE: DESCRIPTION / VEGETATION:	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	RUN: NUMBER	RUN: REC / ATT	SAMPLES: NUMBER	SAMPLES: TYPE	POCKET PENETROMETER (tons/ft²)	LAB TESTS: ENVIRONMENTAL (SPLP & TOTAL METALS)	LAB TESTS: GRAIN SIZE DISTRIBUTION	NOTES WATER LEVELS
0	Sonic	0.0 - 6.4 WATER.			608.5								
		6.4 - 7.9 (CCR) COAL COMBUSTION RESIDUALS, black, wet, soft.			6.4 607.0			1	SONIC		●		
								2	SONIC		●		
		7.9 - 11.4 (SP) SAND, poorly graded, fine, trace gravel, reddish brown, non-cohesive, wet, loose.	SP		7.9 603.5	1	5.00 5.00	3	SONIC		●		
		11.4 - 14.4 (CCR) COAL COMBUSTION RESIDUALS with SAND, fine to coarse, trace to some gravel, black to dark brown, non-cohesive, wet, loose.			11.4 600.5	2	5.00 5.00	4	SONIC		●	●	
		14.4 - 16.4 (SP) SAND, poorly graded, medium to fine, trace gravel and fines, brown, non-cohesive, wet, loose to compact.	SP		14.4 598.5			5	SONIC		●	●	
		Boring completed at 16.4 ft.											

NOTES:
1. Drilled from a barge.
2. Mud line at a depth of 6.4 feet.
3. Drillers observed a hard layer at 14.4 feet while sampling, similar to conditions encountered in JHC-BH-16007. No sample was recovered below 14.4 feet on the initial attempt. Driller obtained full recovery between 11.4 and 16.4 feet on a second attempt.

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

LOGGED: MMJ
CHECKED: JRP
DATE: 6/4/2017

Golder Associates

DUL_BOREHOLE (BC ASH POND) 1654923 JH CAMPBELL ASH PONDS_20160715.GPJ DUL.GOLDER.GDT 6/6/17

APPENDIX B

Bottom Ash Ponds 1-2 N/S CCR Removal Photo Log

Project Title: Ponds 1-2 N/S Excavation Sequence Photo Documentation Log	
PHOTO 1 Date: 2018/06/06 Prior to beginning CCR removal Orientation: Looking north.	
PHOTO 2 Date: 2018/06/06 Prior to beginning CCR removal Orientation: Ortho	

Project Title: Ponds 1-2 N/S Excavation Sequence Photo Documentation Log	
PHOTO 3 Date: 2018/06/21 First day of CCR removal. Orientation: Looking northwest.	
PHOTO 4 Date: 2018/06/25 Orientation: Looking north.	

Project Title: Ponds 1-2 N/S Excavation Sequence Photo Documentation Log	
PHOTO 5 Date: 2018/06/26 Orientation: Looking north.	
PHOTO 6 Date: 2018/06/26 Orientation: Ortho.	

Project Title: Ponds 1-2 N/S Excavation Sequence Photo Documentation Log	
PHOTO 7 Date: 2018/06/28 Orientation: Looking west.	
PHOTO 8 Date: 2018/06/29 Orientation: Looking east.	

Project Title: Ponds 1-2 N/S Excavation Sequence Photo Documentation Log	
PHOTO 9 Date: 2018/07/02 Orientation: Looking south.	
PHOTO 10 Date: 2018/07/06 Orientation: Looking west.	

Project Title: Ponds 1-2 N/S Excavation Sequence Photo Documentation Log	
PHOTO 11 Date: 2018/07/09 Orientation: Looking west.	
PHOTO 12 Date: 2018/07/10 Orientation: Looking southwest.	

Project Title: Ponds 1-2 N/S Excavation Sequence Photo Documentation Log	
PHOTO 13 Date: 2018/07/11 Orientation: Looking south.	
PHOTO 14 Date: 2018/07/12 Orientation: Looking southwest.	

Project Title: Ponds 1-2 N/S Excavation Sequence Photo Documentation Log	
PHOTO 15 Date: 2018/07/24 Orientation: Looking north.	
PHOTO 16 Date: 2018/07/24 Orientation: Ortho.	

Project Title: Ponds 1-2 N/S Excavation Sequence Photo Documentation Log	
PHOTO 17 Date: 2018/07/25 Orientation: Looking southwest.	
PHOTO 18 Date: 2018/07/26 Orientation: Looking south.	

Project Title: Ponds 1-2 N/S Excavation Sequence Photo Documentation Log	
PHOTO 19 Date: 2018/07/30 Orientation: Looking south.	
PHOTO 20 Date: 2018/07/31 Orientation: Looking southwest.	

Project Title: Ponds 1-2 N/S Excavation Sequence Photo Documentation Log	
PHOTO 21 Date: 2018/08/01 Orientation: Looking west.	
PHOTO 22 Date: 2018/08/02 Orientation: Looking south.	

Project Title: Ponds 1-2 N/S Excavation Sequence Photo Documentation Log	
PHOTO 23 Date: 2018/08/03 Orientation: Looking southwest.	
PHOTO 24 Date: 2018/08/07 Orientation: Looking south.	

Project Title: Ponds 1-2 N/S Excavation Sequence Photo Documentation Log	
PHOTO 25 Date: 2018/08/08 Orientation: Looking south.	
PHOTO 26 Date: 2018/08/09 Orientation: Looking south.	

Project Title: Ponds 1-2 N/S Excavation Sequence Photo Documentation Log	
PHOTO 27 Date: 2018/08/13 Orientation: Looking south.	
PHOTO 28 Date: 2018/08/15 Orientation: Looking south.	

Project Title: Ponds 1-2 N/S Excavation Sequence Photo Documentation Log

PHOTO 29 Date: 2018/08/16 Orientation: Looking south.	
PHOTO 30 Date: 2018/08/17 Orientation: Looking south.	

Project Title: Ponds 1-2 N/S Excavation Sequence Photo Documentation Log	
PHOTO 31 Date: 2018/08/20 Orientation: Looking south.	
PHOTO 32 Date: 2018/08/21 Orientation: Looking south.	

Project Title: Ponds 1-2 N/S Excavation Sequence Photo Documentation Log	
PHOTO 33 Date: 2018/08/22 Orientation: Looking North.	
PHOTO 34 Date: 2018/08/22 Orientation: Ortho	

Project Title: Ponds 1-2 N/S Excavation Sequence Photo Documentation Log

PHOTO 35 Date: 2018/08/23 Orientation: Looking southwest.	
PHOTO 36 Date: 2018/08/27 Orientation: Looking south.	

Project Title: Ponds 1-2 N/S Excavation Sequence Photo Documentation Log	
PHOTO 37 Date: 2018/08/28 Orientation: Looking south.	
PHOTO 38 Date: 2018/08/29 Orientation: Looking south.	

Project Title: Ponds 1-2 N/S Excavation Sequence Photo Documentation Log	
PHOTO 39 Date: 2018/08/30 Orientation: Looking south.	
PHOTO 40 Date: 2018/08/31 Orientation: Looking south.	

Project Title: Ponds 1-2 N/S Excavation Sequence Photo Documentation Log	
PHOTO 41 Date: 2018/09/04 Orientation: Looking south.	
PHOTO 42 Date: 2018/09/05 Orientation: Looking south.	

PHOTO 42 Date: 2018/09/18 Orientation: Looking north.	
PHOTO 42 Date: 2018/09/18 Orientation: Ortho	

PHOTO 42 Date: 2018/10/25 Orientation: Looking north.	
PHOTO 42 Date: 2018/10/25 Orientation: Ortho	

APPENDIX C

Bottom Ash Ponds 1-2 N/S Grid Node Photographic Documentation Log

Project Title: Ponds 1-2 N/S Grid Node Photographic Documentation Log	
PHOTO 1 **Node Number:** 2 **Location:** North -1300.00, East 1909.28 **Colorimeter Result:** 3.47 percent CCR	
PHOTO 2 **Node Number:** 3 **Location:** North -1050.00, East 2000.00 **Colorimeter Result:** Non-detectable (ND), -1.17 percent CCR	

Project Title: Ponds 1-2 N/S Grid Node Photographic Documentation Log	
PHOTO 3 **Node Number:** 6 **Location:** North -1100.00, East 1916.85 **Colorimeter Result:** N/A	
PHOTO 4 **Node Number:** 8 **Location:** North -1000.00, East 1920.59 **Colorimeter Result:** N/A	

Project Title: Ponds 1-2 N/S Grid Node Photographic Documentation Log

PHOTO 5

Node Number: 9
Location: North -950.00, East 1923.12
Colorimeter Result: N/A

PHOTO 6

Node Number: 10
Location: North -900.00, East 1928.57
Colorimeter Result: ND, -1.52 percent CCR

Project Title: Ponds 1-2 N/S Grid Node Photographic Documentation Log

PHOTO 7 **Node Number:** 11 **Location:** North -1385.30, East 1950.00 **Colorimeter Result:** 0.97 percent CCR	
PHOTO 8 **Node Number:** 13 **Location:** North -1300.00, East 1950.00 **Colorimeter Result:** ND, -0.34 percent CCR	

Project Title: Ponds 1-2 N/S Grid Node Photographic Documentation Log	
PHOTO 9 **Node Number:** 15 **Location:** North -1200.00, East 1950.00 **Colorimeter Result:** N/A **Note:** Darker brown and red sand	
PHOTO 10 **Node Number:** 16 **Location:** North -1150.00, East 1950.00 **Colorimeter Result:** N/A	

Project Title: Ponds 1-2 N/S Grid Node Photographic Documentation Log

PHOTO 11 **Node Number:** 19 **Location:** North -1000.00, East 1950.00 **Colorimeter Result:** 3.87 percent CCR	
PHOTO 12 **Node Number:** 21 **Location:** North -900.00, East 1950.00 **Colorimeter Result:** N/A	

Project Title: Ponds 1-2 N/S Grid Node Photographic Documentation Log	
PHOTO 13 **Node Number:** 22 **Location:** North -856.34, East 1950.00 **Colorimeter Result:** N/A	
PHOTO 14 **Node Number:** 25 **Location:** North -1300.00, East 2000.00 **Colorimeter Result:** N/A	

Project Title: Ponds 1-2 N/S Grid Node Photographic Documentation Log

PHOTO 15 **Node Number:** 26 **Location:** North -1250.00, East 2000.00 **Colorimeter Result:** 2.11 percent CCR	
PHOTO 16 **Node Number:** 27 **Location:** North -1200.00, East 2000.00 **Colorimeter Result:** N/A	

Project Title: Ponds 1-2 N/S Grid Node Photographic Documentation Log	
PHOTO 17 **Node Number:** 29 **Location:** North -1100.00, East 2000.00 **Colorimeter Result:** N/A	
PHOTO 18 **Node Number:** 30 **Location:** North -1050.00, East 2000.00 **Colorimeter Result:** ND, -0.95 percent CCR	

Project Title: Ponds 1-2 N/S Grid Node Photographic Documentation Log	
PHOTO 19 **Node Number:** 31 **Location:** North -1000.00, East 2000.00 **Microscopy Result:** 1.0 percent CCR **Note:** Sand exhibits more orange tint than base sand on which reference curves are based.	
PHOTO 20 **Node Number:** 36 **Location:** North -1400.00, East 2050.00 **Microscopy Result:** 0.5 percent CCR **Note:** Sand exhibits browner tint than base sand on which reference curves are based.	

Project Title: Ponds 1-2 N/S Grid Node Photographic Documentation Log

PHOTO 21 **Node Number:** 40 **Location:** North -1200.00, East 2050.00 **Microscopy Result:** Less than 1.0 percent CCR **Note:** Sand exhibits somewhat more orange tint than base sand on which reference curves are based.	
PHOTO 22 **Node Number:** 42 **Location:** North -1100.00, East 2050.00 **Colorimeter Result:** 4.24 percent CCR	

Project Title: Ponds 1-2 N/S Grid Node Photographic Documentation Log	
PHOTO 23 **Node Number:** 43 **Location:** North -1050.00, East 2050.00 **Colorimeter Result:** N/A	
PHOTO 24 **Node Number:** 45 **Location:** North -950.00, East 2050.00 **Colorimeter Result:** N/A	

Project Title: Ponds 1-2 N/S Grid Node Photographic Documentation Log	
PHOTO 25 **Node Number:** 46 **Location:** North -900.00, East 2050.00 **Colorimeter Result:** ND, -0.95 percent CCR	
PHOTO 26 **Node Number:** 47 **Location:** North -850.00, East 2050.00 **Colorimeter Result:** N/A	

Project Title: Ponds 1-2 N/S Grid Node Photographic Documentation Log

PHOTO 27

Node Number: 48R
Location: North -800.00, East 2050.00
Colorimeter Result: N/A

PHOTO 28

Node Number: 49R
Location: North -765.34, East 2050.00
Microscopy Result: 2.0 percent CCR
Notes: Sample contained dark organic debris (e.g. fragements of twigs/bark). Sand exhibits browner tint than base sand on which reference curves are based.

Project Title: Ponds 1-2 N/S Grid Node Photographic Documentation Log	
PHOTO 29 **Node Number:** 50 **Location:** North -1397.24, East 2100.00 **Colorimeter Result:** N/A	
PHOTO 30 **Node Number:** 51 **Location:** North -1350.00, East 2100.00 **Colorimeter Result:** 2.11 percent CCR	

Project Title: Ponds 1-2 N/S Grid Node Photographic Documentation Log	
PHOTO 31 **Node Number:** 52 **Location:** North -1300.00, East 2100.00 **Colorimeter Result:** 0.97 percent CCR	
PHOTO 32 **Node Number:** 53 **Location:** North -1250.00, East 2100.00 **Colorimeter Result:** N/A	

Project Title: Ponds 1-2 N/S Grid Node Photographic Documentation Log	
PHOTO 33 **Node Number:** 54 **Location:** North -1200.00, East 2100.00 **Colorimeter Result:** ND, -0.95 percent CCR	
PHOTO 34 **Node Number:** 56 **Location:** North -1100.00, East 2100.00 **Colorimeter Result:** N/A	

Project Title: Ponds 1-2 N/S Grid Node Photographic Documentation Log	
PHOTO 35 **Node Number:** 57 **Location:** North -1050.00, East 2100.00 **Colorimeter Result:** 3.49 percent CCR	
PHOTO 36 **Node Number:** 58 **Location:** North -1000.00, East 2100.00 **Colorimeter Result:** N/A	

Project Title: Ponds 1-2 N/S Grid Node Photographic Documentation Log

PHOTO 37 **Node Number:** 60 **Location:** North -900.00, East 2100.00 **Colorimeter Result:** N/A	
PHOTO 38 **Node Number:** 64 **Location:** North -1376.80, East 2150.00 **Colorimeter Result:** 2.76 percent CCR	

Project Title: Ponds 1-2 N/S Grid Node Photographic Documentation Log	
PHOTO 39 **Node Number:** 66 **Location:** North -1300.00, East 2150.00 **Colorimeter Result:** N/A	
PHOTO 40 **Node Number:** 70 **Location:** North -1100.00, East 2150.00 **Colorimeter Result:** N/A	

Project Title: Ponds 1-2 N/S Grid Node Photographic Documentation Log	
PHOTO 41 **Node Number:** 71R **Location:** North -1050.00, East 2150.00 **Colorimeter Result:** ND, -1.17 percent CCR	
PHOTO 42 **Node Number:** 72 **Location:** North -1000.00, East 2150.00 **Colorimeter Result:** 0.04 percent CCR	

Project Title: Ponds 1-2 N/S Grid Node Photographic Documentation Log

PHOTO 43 **Node Number:** 74 **Location:** North -900.00, East 2150.00 **Microscopy Result:** 1.0 percent CCR **Note:** Sand exhibits browner tint than base sand on which reference curves are based.	
PHOTO 44 **Node Number:** 75 **Location:** North -850.00, East 2150.00 **Colorimeter Result:** N/A	

Project Title: Ponds 1-2 N/S Grid Node Photographic Documentation Log	
PHOTO 45 **Node Number:** 78 **Location:** North -1368.72, East 2200.00 **Colorimeter Result:** 0.04 percent CCR	
PHOTO 46 **Node Number:** 83 **Location:** North -1150.00, East 2200.00 **Colorimeter Result:** N/A	

Project Title: Ponds 1-2 N/S Grid Node Photographic Documentation Log	
PHOTO 47 **Node Number:** 84 **Location:** North -1100.00, East 2200.00 **Colorimeter Result:** N/A	
PHOTO 48 **Node Number:** 86 **Location:** North -1000.00, East 2200.00 **Colorimeter Result:** N/A	

Project Title: Ponds 1-2 N/S Grid Node Photographic Documentation Log

PHOTO 49 **Node Number:** 88 **Location:** North -900.00, East 2200.00 **Colorimeter Result:** N/A	
PHOTO 50 **Node Number:** 93 **Location:** North -1300.00, East 2243.00 **Colorimeter Result:** 1.52 percent CCR	

Project Title: Ponds 1-2 N/S Grid Node Photographic Documentation Log	
PHOTO 51 **Node Number:** 95 **Location:** North -1200.00, East 2231.00 **Colorimeter Result:** ND, -0.34 percent CCR	
PHOTO 52 **Node Number:** 103 **Location:** North -800.00, East 2228.33 **Microscopy Result:** less than 0.5 percent CCR **Note:** Sand exhibits browner tint than base sand on which reference curves are based.	

APPENDIX D

CTL Group CCR Removal Microscopy Memo

CTLGroup MEMO

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

Date: March 22, 2019
From: Laura Powers

Subject: **Microscopical Examination of CCR Ponds 1-2 Colorimetry Fail Samples**

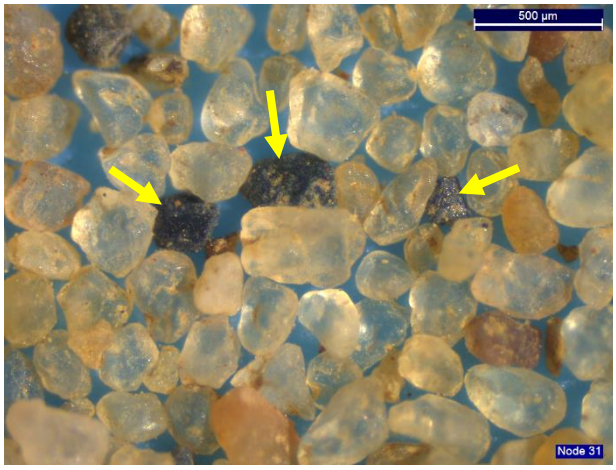
CTLGroup has re-analyzed a suite of field samples from the Ponds 1-2 nodes listed in Table 1 to estimate the amount of CCR and provide micrographs illustrating the general characteristics of the soil. Field colorimetry values for these samples exceeded the 5% threshold. Field microscopy determined that 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%.

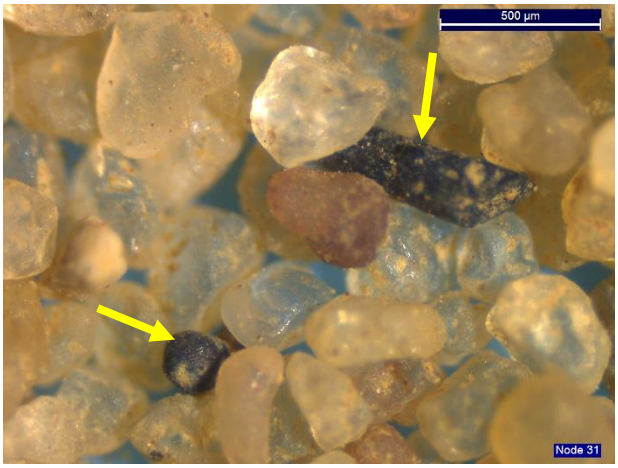
TABLE 1 PONDS 1-2 NODE SAMPLES

Nodes	Field Microscopy Estimate of CCR%	Laboratory Estimate of CCR %
31	1 to 3	1
36	<0.5	0.5
40R	<1	<1
49R	2 to 4	2
74	<2	1
103	<2	<0.5

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 sand is lightly coated with silty material. Substantial amounts of darker colored rocks and minerals are present



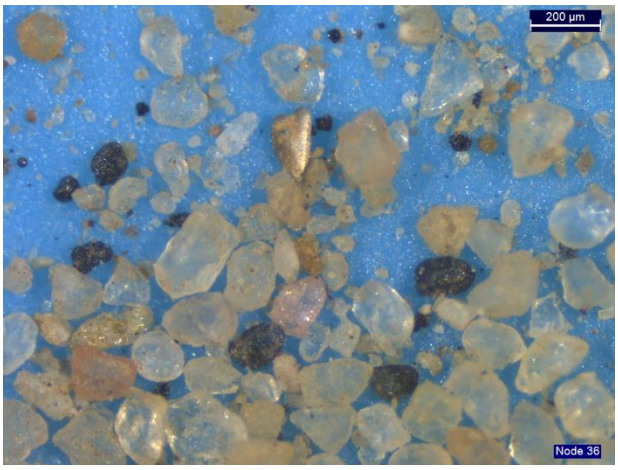


Arrows show CCR particles.

Node 31 Estimated CCR content is 1%. The color of the sample is influenced by silty coatings on sand particles and by the presence of darker colored minerals and rocks.

The sample is clean sand that mainly consists of white, pale yellow, and colorless transparent quartz. Dark red, green, brown, and gray particles of various minerals and rocks are common. Arrow shows a CCR particle.

Arrow shows black CCR particle.

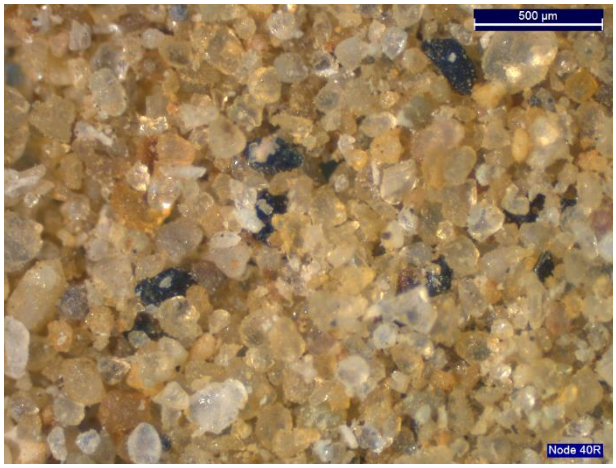


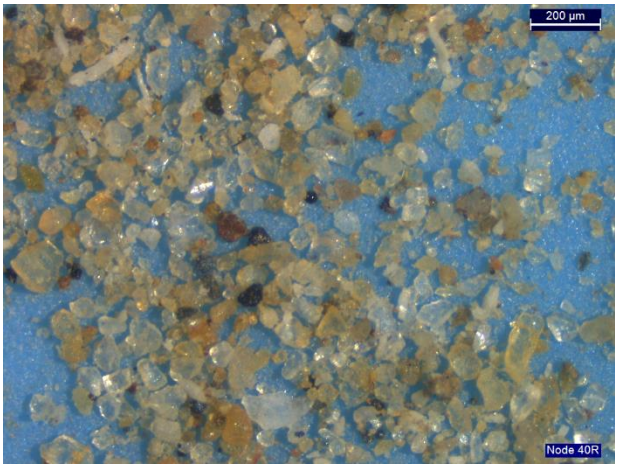
Dark particles are CCR. Most CCR particles are observed in the fines (note scale bar).

Node 36 Estimated CCR content is 1%. Particles have minimal amounts of silty coatings. The color of the sample is mainly influenced by the abundance of darker colored particles of granite, chert, schist, siltstone, and other rocks and minerals. CCR is mainly present among the very small particles.

The sand is unevenly coated with yellow silty material. Darker colored particles are mostly schist, chert, and granite.

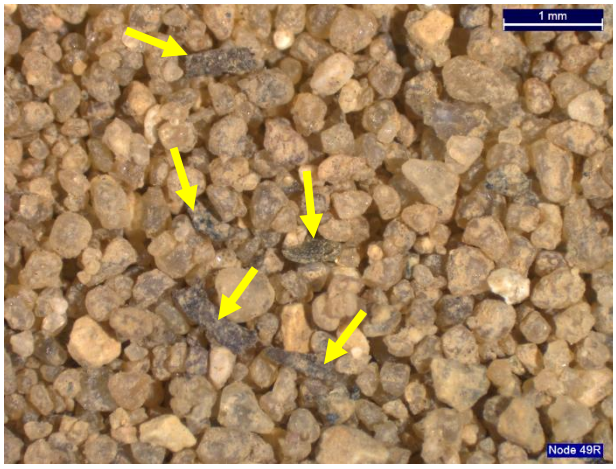
Many of the particles do not exhibit yellow coatings.



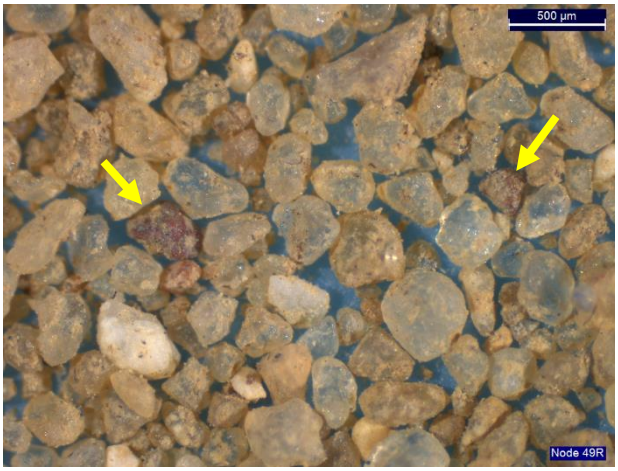


Black particles are CCR. Most CCR particles are observed in the fines (note scale bar).

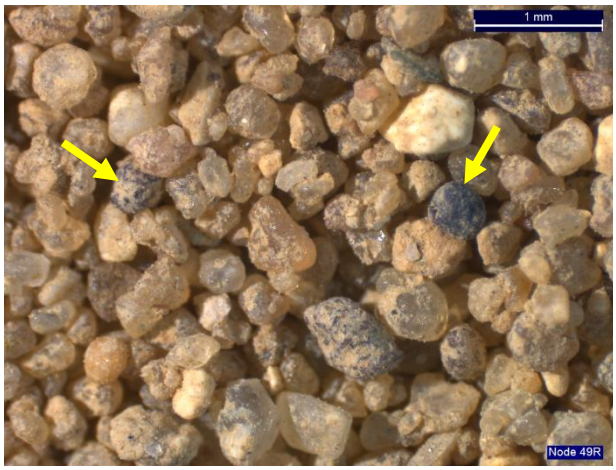
Node 40R Estimated CCR content is 1%. Particles have variable amounts of silty coatings. The color of the sample is mainly influenced by yellow coatings and the abundance of darker colored particles of granite, chert, schist, siltstone, and other rocks and minerals. CCR is mainly present among the very small particles.



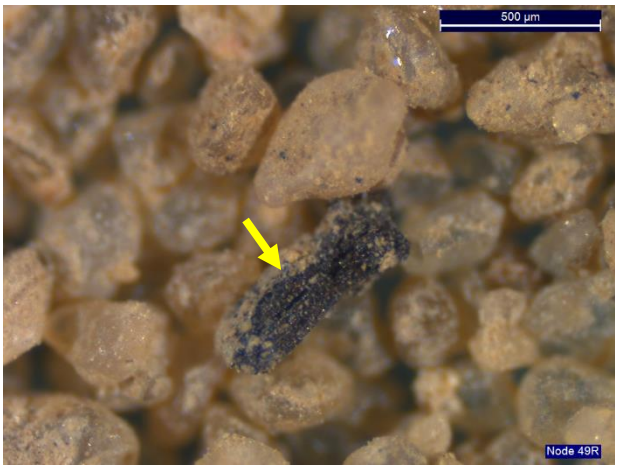
Sand particles are heavily coated with buff-colored silty material that partially obscures the color of the particles. Arrows show plant matter that rose to the surface of the sample.



Arrows show dark red granite particles. Note locally heavy pink-buff coatings on sand particles.

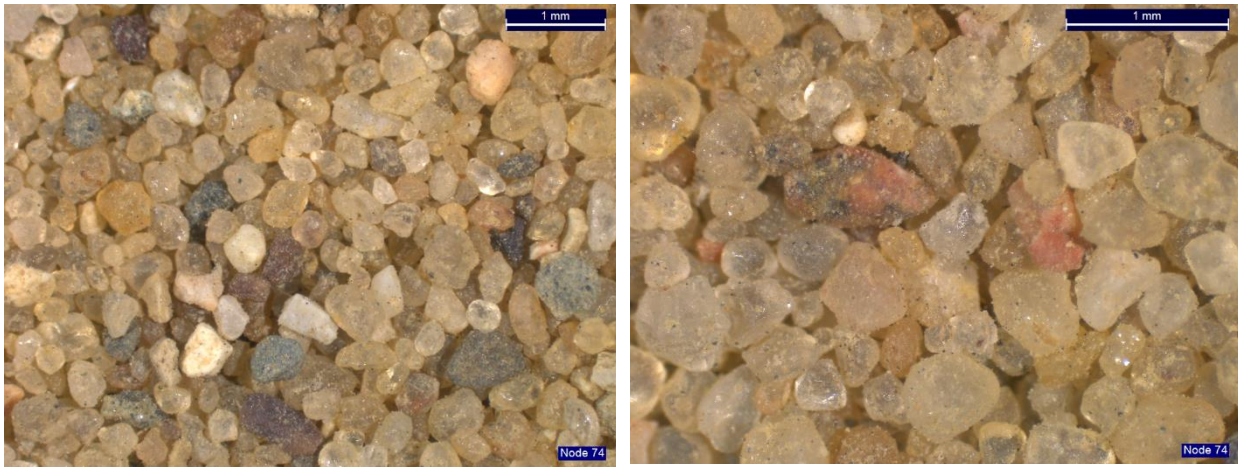


Arrows show spherical black CCR particles that are partially coated with silty material.

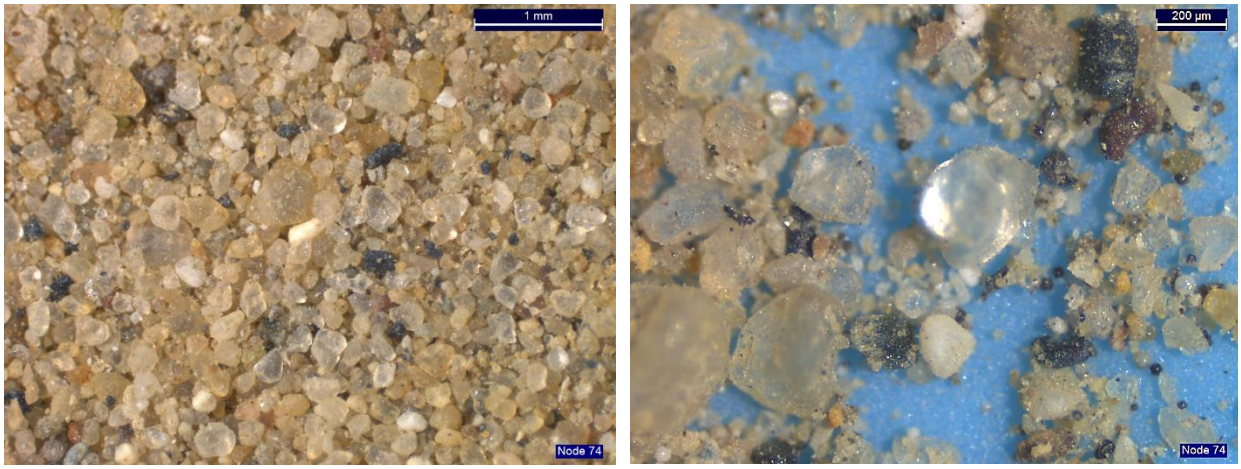


Arrow shows black porous carbon CCR particle.

Node 49R Estimated CCR content is 1%. The color of the sample is mainly influenced by the silty coating and the presence of plant material. Darker colored sand particles are partially obscured by the coatings, which are less prominent on the CCR particles.



Red, green, and gray particles are mostly schist, chert, and granite. Sand particles are lightly coated with buff-colored silty material.



Black and red-black particles are CCR. Most CCR particles are observed in the fines (note scale bars).

Node 74 Estimated CCR content is 1%. Particles have minimal amounts of silty coatings. The color of the sample is mainly influenced by the abundance of darker colored particles of granite, chert, schist, siltstone, and other rocks and minerals.

Red, green, and gray particles are mostly schist, chert, and granite. Sand particles are minimally coated with buff-colored silty material.

Arrow show plant matter.

Arrow show black CCR particle.

Node 103 Estimated CCR content is <0.5%. Particles have minimal amounts of silty coatings. The color of the sample is mainly influenced by the abundance of darker colored rock and mineral particles. Only trace amounts of plant matter and CCR or observed.

golder.com

Attachment 2
EGLE CCR Removal Documentation Concurrence Letter

STATE OF MICHIGAN
DEPARTMENT OF
ENVIRONMENT, GREAT LAKES, AND ENERGY
GRAND RAPIDS DISTRICT OFFICE

GRETCHEN WHITMER
GOVERNOR

LIESL EICHLER CLARK
DIRECTOR

October 22, 2019

Mr. Brad Runkel, P.E.
Consumers Energy-Energy Services Department
1945 West Parnell Road
Jackson, Michigan 49201

Dear Mr. Runkel:

SUBJECT: Bottom Ash Ponds 1-2 N/S CCR Removal Documentation Report, Consumers Energy JH Campbell Landfill, Ottawa County

Staff of the Department of Environment, Great Lakes and Energy (EGLE) have reviewed the Bottom Ash Pond 3 N/S CCR Removal Documentation Report, which was submitted on August 26, 2019. Based on observations by EGLE staff during the removal process and the report, EGLE concurs with Consumers Energy Company that the bottom ash in Ponds 1-2 N/S has been removed and multiple lines of evidence of the removal has been documented.

This certification approval is simply for removal of the bottom ash that is a regulated solid waste under Part 115-Solid Waste Management of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended. This certification approval does not in any way constitute an approval under the Disposal of Coal Combustion Residuals from Electric Utilities Final Rule (CCR Rule). EGLE understands that Consumers is currently performing hydrogeologic monitoring as required under the CCR Rule and will determine if the use of the bottom ash ponds has caused any impacts to groundwater.

If you have any questions, please contact me at 616-356-0229.

Sincerely,

Timothy J. Unseld

Timothy J. Unseld, Environmental Engineer
Grand Rapids District Office
Materials Management Division

TU:kw

cc: Ms. Bethany Swanberg, Consumers Energy
Mr. Kevin Starken, Consumers Energy
Ms. Margie Ring, EGLE (via e-mail)
Mr. Fred Sellers, EGLE
Mr. Kent Walters, EGLE
Ms. Christine Veldkamp, EGLE

Attachment 3
Statistical Analysis

1540 Eisenhower Pl.
Ann Arbor, MI 48108

T 734.971.7080
TRCcompanies.com

Technical Memorandum

Date:	September 15, 2023
To:	Bethany Swanberg, Consumers Energy
From:	Sarah Holmstrom, TRC Kristin Lowery, TRC Henry Schnaidt, TRC
Project No.:	514398.0000.0000 Phase 1 Task 3
Subject:	Remedy Completion Statistical Evaluation for Arsenic in Groundwater, JH Campbell Bottom Ash Ponds 1-2 North and 1-2 South CCR Unit, Consumers Energy Company, West Olive, Michigan

On behalf of Consumers Energy (CE), TRC has prepared this statistical evaluation of arsenic concentrations in groundwater following removal of coal combustion residuals (CCR) and completion of over four consecutive years of post-remedy monitoring at the JH Campbell Ponds 1-2 North and 1-2 South CCR Unit (Ponds 1-2) to document successful completion of the final selected remedy per §257.98(c) of 40 CFR Parts 257 and 261, Disposal of Coal Combustion Residuals from Electric Utilities, under subtitle D of the Resource Conservation and Recovery Act (RCRA), also known as the CCR rule. CE has identified Source Removal with Post Remedy Monitoring as the selected remedy for Ponds 1-2 pursuant to §257.97 to address the potential for residual arsenic associated with Ponds 1-2 activities. In accordance with §257.98 of the CCR Rule[1], in order to consider a remedy complete, the corrective action groundwater monitoring program must demonstrate that compliance with the Groundwater Protection Standards (GWPSs) established under §257.95(h) have been achieved at the downgradient wells for a minimum of three consecutive years using the statistical procedures and performance standards in §257.93(f) and (g).

GWPSs were established in accordance with §257.95(h) as detailed in the October 15, 2018 Groundwater Protection Standards technical memorandum, which was also included in the 2018 Annual Groundwater Monitoring Report (2018 Annual Report) (TRC, January 2019). The following narrative describes the methods that were employed for comparisons to the GWPSs that demonstrate completion of the corrective action.

Post-Remedy Groundwater Data

The post-remedy groundwater monitoring dataset used in this statistical evaluation was collected following CCR removal in 2018 over four consecutive years from February 15, 2019 to April 13, 2023. Groundwater monitoring data are documented in the 2019 through 2022 annual groundwater

[1] USEPA final rule for the regulation and management of Coal Combustion Residuals (CCR) under the Resource Conservation and Recovery Act (RCRA) published April 17, 2015, as amended.

monitoring reports that also show the requirements of an assessment monitoring program are met under §257.95. Documentation of the April 2023 groundwater monitoring event will be included in the forthcoming 2023 Annual Groundwater Monitoring and Corrective Action Report required under §257.90(e).

Corrective action for Ponds 1-2 was triggered due to exceedances of the GWPS for arsenic at former downgradient monitoring wells JHC-MW-15002 and JHC-MW-15003. Following the cessation of hydraulic loading to Ponds 1-2 and the pond closure, the groundwater flow regime changed such that JHC-MW-15002 and JHC-MW-15003 were no longer located downgradient of Ponds 1-2. Therefore, only groundwater data collected during the post-CCR removal time period of February 2019 through April 2023 from the monitoring wells located downgradient from Ponds 1-2 under the post-remedy groundwater flow regime were used for this statistical evaluation. As such, groundwater data from the current certified compliance monitoring well network (monitoring wells JHC-MW-18004, JHC-MW-18005, and JHC-MW-22001) as well as downgradient nature and extent monitoring wells (JHC-MW-15005, PZ-23S, and PZ-23D) were used to assess attainment of groundwater protection standards for arsenic in accordance with the Groundwater Statistical Evaluation Plan (Stats Plan) (TRC, October 2017) and the Unified Guidance[2].

This post-remedy arsenic dataset serves as both the assessment monitoring and the corrective action groundwater monitoring program dataset that has been used to perform the remedy completion statistical evaluation. A summary of the post-remedy arsenic dataset is provided in Table 1 and in the time-series plot provided in Attachment 1. Table 1 and the time-series plot show that all of the post-remedy data are below the arsenic GWPS, with the exception of one datapoint from JHC-MW-18005 collected at the onset of post-remedy monitoring in February 2019. The post-remedy arsenic dataset shows well over the three minimum consecutive years below the GWPS at the downgradient wells. The statistical evaluation presented below was performed in order to comply with the statistical analysis requirements of §257.98(c).

Corrective Action Statistical Evaluation

The assessment and post-remedy (i.e. corrective action) monitoring program was developed to evaluate concentrations of CCR constituents associated with Ponds 1-2 that are present in the uppermost aquifer relative to acceptable levels (i.e. GWPSs). Per the Unified Guidance, while a unit is in assessment monitoring, a statistical comparison is made to determine whether groundwater concentrations have increased above the established compliance standard to identify the need for corrective action. Once corrective action is required, the statistical evaluation of groundwater monitoring data is used to determine whether concentrations have decreased below a clean-up criterion or compliance level. To evaluate whether or not the cleanup level(s) (i.e. GWPS) has been met, the difference in concentration observed at the downgradient wells during a given assessment or corrective action monitoring event compared to the GWPS must be large enough, after accounting for variability in the sample data, that the result is unlikely to have occurred merely by chance. Consistent with the Unified Guidance, the preferred method for comparisons to a fixed standard is confidence limits. Based on the number of observations in the representative sample population, the sample mean, the sample standard deviation, and a selected confidence level (i.e. 99 percent), an upper

[2] USEPA. 2009. *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, Unified Guidance*. Office of Conservation and Recovery. EPA 530/R-09-007.

confidence limit (UCL) and lower confidence limit (LCL) is calculated. The actual mean concentration of the population, with 99 percent confidence, will fall between the lower and upper confidence limits. In compliance/assessment monitoring, the LCL is of primary interest, where an increase of the LCL above the GWPS is what triggers corrective action. Whereas the UCL is most important in corrective action, where a UCL below the GWPS demonstrates that the compliance criterion has been met.

The concentrations observed in the downgradient wells are deemed to have met the GWPS when the 99 percent UCL of the downgradient data is below the GWPS. If the confidence interval straddles the GWPS (i.e. the LCL is below the GWPS but the UCL is above), the statistical test result indicates that there is insufficient confidence that the measured concentrations are different from the GWPS and thus there is no compelling evidence that the true mean concentration falls below the GWPS. This statistical approach is consistent with the statistical methods presented in §257.93(f) and (g).

Groundwater data for the arsenic concentrations measured within the post-remedy time period (February 2019 through April 2023) at all downgradient assessment monitoring and nature and extent wells were evaluated utilizing Sanitas™ statistical software. Sanitas™ is a software tool that is commercially available for performing statistical evaluation consistent with procedures outlined in the Unified Guidance. Within the Sanitas™ statistical program, confidence limits were selected to perform the statistical comparison of compliance data to a fixed standard. Parametric or non-parametric confidence intervals were calculated, as appropriate, for arsenic using a 99 percent confidence level, i.e., a significance level (α) of 0.01. The Sanitas™ output files are included in Attachment 1.

The statistical data evaluation included the following steps:

- Review of data quality checklists for the data sets;
- Graphical representation of the monitoring data as time versus concentration by well-constituent pair;
- Outlier testing of individual data points that appear from the graphical representations as potential outliers;
- Evaluation of visual trends apparent in the graphical representations for statistical significance;
- Evaluation of percentage of non-detects for each well-constituent pair;
- Distribution of the data; and
- Calculation of the confidence intervals for each dataset.

The results of these evaluations are presented and discussed below. The statistical evaluation was completed for monitoring wells JHC-MW-15005, JHC-MW-18004, JHC-MW-18005, and PZ-23S. The number of data points at monitoring wells JHC-MW-22001 and PZ-23D are not enough to perform statistical analysis; however, direct comparison of the results to the GWPS was still performed as shown on Table 1. As shown on Table 1, arsenic concentrations at JHC-MW-22001 and PZ-23D have remained well below the GWPS throughout the post-remedy monitoring period.

Data from each round were evaluated for completeness, overall quality, and usability and were deemed appropriate for the purposes of the CCR assessment monitoring program.

Initially, the results for these well-constituent pairs were observed visually for potential outliers and trends. No outliers were apparent. The Sanitas™ software was then used to test for any trends in arsenic concentrations at each well using the Sen's Slope/Mann-Kendall Trend Test at a 98% confidence level. No statistically significant trends were found. Trend tests are included in Attachment 1.

The Sanitas™ software was then used to compare concentrations at the downgradient monitoring wells to the GWPS using the confidence interval method for data from the post-remedy period. The Sanitas™ software tests the distribution of the data using the Shapiro-Wilk test for normality on the raw data and the Ladder of Powers-transformed data. The significance level (α) of the normality test is determined based on the number of data points for each well in accordance with the Unified Guidance. The normality test summary report is included in Attachment 1. Non-detect data was handled in accordance with the Stats Plan for the purposes of calculating the confidence intervals.

Data distributions were as follows:

Distribution	Parameter-Well Combinations
Normalized by square root transformation	Arsenic at JHC-MW-15005 (α = 0.1)
Non-Parametric (non-detects)	Arsenic at JHC-MW-18004 (54% non-detect)
Non-Parametric (not able to be normalized)	Arsenic at JHC-MW-18005 (α = 0.05)
Non-Parametric (non-detects)	Arsenic at PZ-23S (100% non-detect)

Confidence interval tests were run with a per-well significance of α = 0.01. The software outputs are included in Attachment 1 along with data reports showing the values used for the evaluation. The Sanitas™ software generates an output that includes graphs of the parametric or non-parametric confidence intervals for each well along with notes on data transformations, as appropriate.

The confidence interval test compares the UCL and LCL to the GWPS. The statistical evaluation demonstrates that all of the UCLs for the downgradient arsenic concentrations are below the GWPSs over the four consecutive years of post-remedy monitoring.

Attachments

Table 1 Comparison of Groundwater Sampling Results to Groundwater Protection Standards for Remedy Completion Statistical Evaluation

Attachment 1 Sanitas™ Output

Table

Table 1

Comparison of Groundwater Sampling Results to Groundwater Protection Standards for Remedy Completion Statistical Evaluation

JH Campbell Ponds 1-2N/1-2S

West Olive, Michigan

Sample Location:			JHC-MW-15005									
Sample Date:			4/25/2019	4/25/2019	10/9/2019	4/16/2020	10/22/2020	4/13/2021	4/13/2021	10/21/2021	4/13/2022	10/20/2022	4/12/2023
Constituent	Unit	GWPS		Field Dup					Field Dup				
Arsenic	ug/L	**10**	1.2	1.1	1.4	1	2	3	2	2	2	2	2

Notes:

ug/L - micrograms per liter.

GWPS - Groundwater Protection Standard. GWPS is the higher of the Maximum Contaminant Level/Regional Screening Level and Upper Tolerance Limit as established in TRC's Technical Memorandum dated October 15, 2018.

Bold value indicates an exceedance of the GWPS. Data from downgradient monitoring wells are screened against the GWPS for evaluation purposes only. Confidence intervals will be used to determine compliance per the CCR rules.

All metals were analyzed as total unless otherwise specified.

Table 1

Comparison of Groundwater Sampling Results to Groundwater Protection Standards for Remedy Completion Statistical Evaluation

JH Campbell Ponds 1-2N/1-2S

West Olive, Michigan

		Sample Location:	JHC-MW-18004										
		Sample Date:	2/28/2019	4/25/2019	8/13/2019	10/9/2019	4/16/2020	10/22/2020	4/13/2021	10/22/2021	4/13/2022	10/20/2022	4/12/2023
Constituent	Unit	GWPS											
Arsenic	ug/L	**10**	< 1.0	1.1	1.2	1.1	< 1	1	< 1	1	< 1	< 1	< 1

Notes:

ug/L - micrograms per liter.

GWPS - Groundwater Protection Standard. GWPS is the higher of the Maximum Contaminant Level/Regional Screening Level and Upper Tolerance Limit as established in TRC's Technical Memorandum dated October 15, 2018.

Bold value indicates an exceedance of the GWPS. Data from downgradient monitoring wells are screened against the GWPS for evaluation purposes only. Confidence intervals will be used to determine compliance per the CCR rules.

All metals were analyzed as total unless otherwise specified.

Table 1

Comparison of Groundwater Sampling Results to Groundwater Protection Standards for Remedy Completion Statistical Evaluation

JH Campbell Ponds 1-2N/1-2S

West Olive, Michigan

		Sample Location:	JHC-MW-18005																JHC-MW-22001			
		Sample Date:	2/28/2019	2/28/2019	4/25/2019	8/13/2019	8/13/2019	10/9/2019	4/16/2020	10/22/2020	10/22/2020	4/13/2021	10/22/2021	4/13/2022	4/13/2022	10/20/2022	10/20/2022	4/12/2023	5/19/2022	5/19/2022	10/20/2022	4/12/2023
Constituent	Unit	GWPS		Field Dup			Field Dup				Field Dup				Field Dup		Field Dup			Field Dup		
Arsenic	ug/L	**10**	10	**11**	8.8	7.4	7.3	7.1	8	8	8	8	8	7	7	7	7	7	5	5	5	5

Notes:

ug/L - micrograms per liter.

GWPS - Groundwater Protection Standard. GWPS is the higher of the Maximum Contaminant Level/Regional Screening Level and Upper Tolerance Limit as established in TRC's Technical Memorandum dated October 15, 2018.

Bold value indicates an exceedance of the GWPS. Data from downgradient monitoring wells are screened against the GWPS for evaluation purposes only. Confidence intervals will be used to determine compliance per the CCR rules.

All metals were analyzed as total unless otherwise specified.

Table 1

Comparison of Groundwater Sampling Results to Groundwater Protection Standards for Remedy Completion Statistical Evaluation

JH Campbell Ponds 1-2N/1-2S

West Olive, Michigan

		Sample Location:	PZ-23S																				
		Sample Date:	2/15/2019	4/17/2019	4/23/2019	4/23/2019	8/12/2019	10/9/2019	2/11/2020	4/16/2020	7/15/2020	10/21/2020	2/23/2021	4/14/2021	8/17/2021	10/21/2021	2/22/2022	4/13/2022	7/15/2022	10/19/2022	10/19/2022	1/25/2023	4/13/2023
Constituent	Unit	GWPS				Field Dup															Field Dup		
Arsenic	ug/L	**10**	< 1	< 1	< 1.0	< 1.0	< 1	< 1.0	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1

Notes:

ug/L - micrograms per liter.

GWPS - Groundwater Protection Standard. GWPS is the higher of the Maximum Contaminant Level/Regional Screening Level and Upper Tolerance Limit as established in TRC's Technical Memorandum dated October 15, 2018.

Bold value indicates an exceedance of the GWPS. Data from downgradient monitoring wells are screened against the GWPS for evaluation purposes only. Confidence intervals will be used to determine compliance per the CCR rules.

All metals were analyzed as total unless otherwise specified.

Table 1

Comparison of Groundwater Sampling Results to Groundwater Protection Standards for Remedy Completion Statistical Evaluation

JH Campbell Ponds 1-2N/1-2S

West Olive, Michigan

		Sample Location:	PZ-23D	
		Sample Date:	4/23/2019	10/9/2019
Constituent	Unit	GWPS		
Arsenic	ug/L	**10**	< 1.0	< 1.0

Notes:

ug/L - micrograms per liter.

GWPS - Groundwater Protection Standard. GWPS is the higher of the Maximum Contaminant Level/Regional Screening Level and Upper Tolerance Limit as established in TRC's Technical Memorandum dated October 15, 2018.

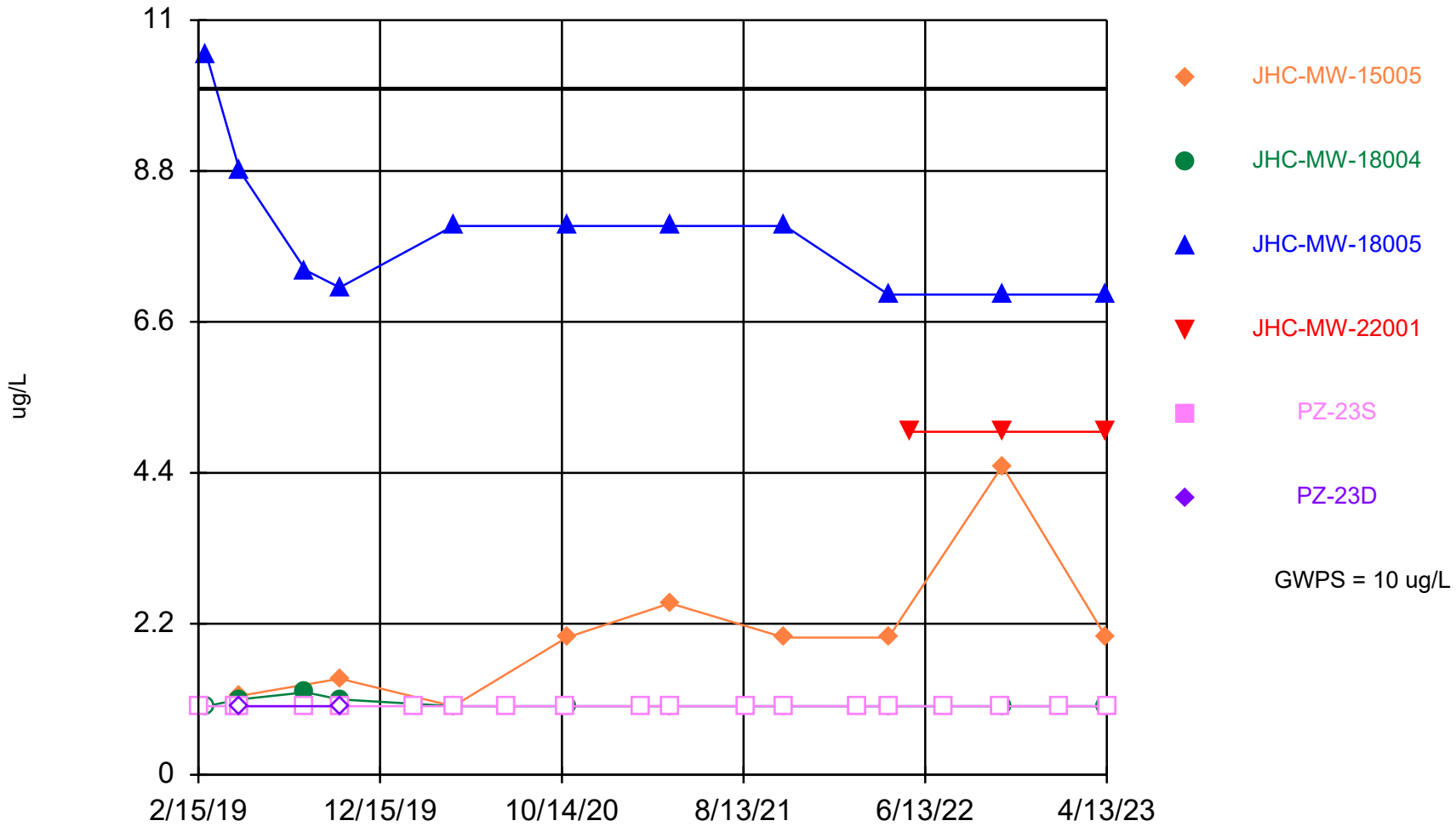
Bold value indicates an exceedance of the GWPS. Data from downgradient monitoring wells are screened against the GWPS for evaluation purposes only. Confidence intervals will be used to determine compliance per the CCR rules.

All metals were analyzed as total unless otherwise specified.

Attachment 1
Sanitas™ Output

Hollow symbols indicate censored values.

Arsenic Comparison to GWPS

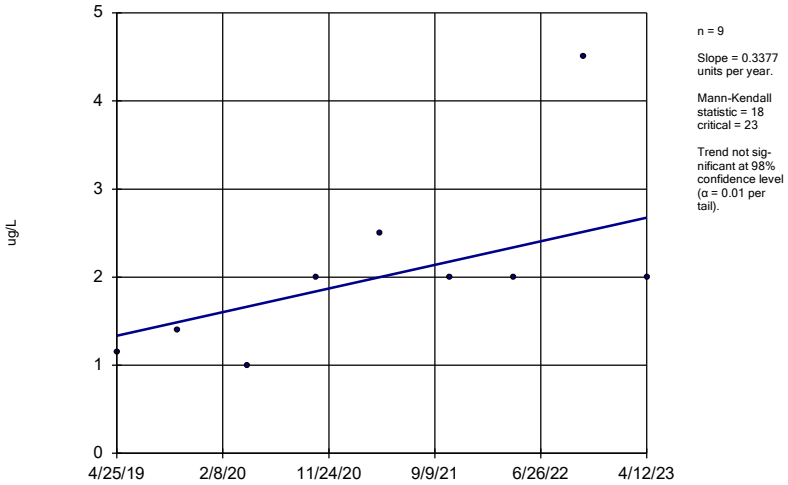


Time Series Analysis Run 9/6/2023 2:51 PM

Client: Consumers Energy Data: 2Q23_JHC_Sanitas

Arsenic, Total

JHC-MW-15005



n = 9

Slope = 0.3377 units per year.

Mann-Kendall statistic = 18 critical = 23

Trend not significant at 98% confidence level (α = 0.01 per tail).

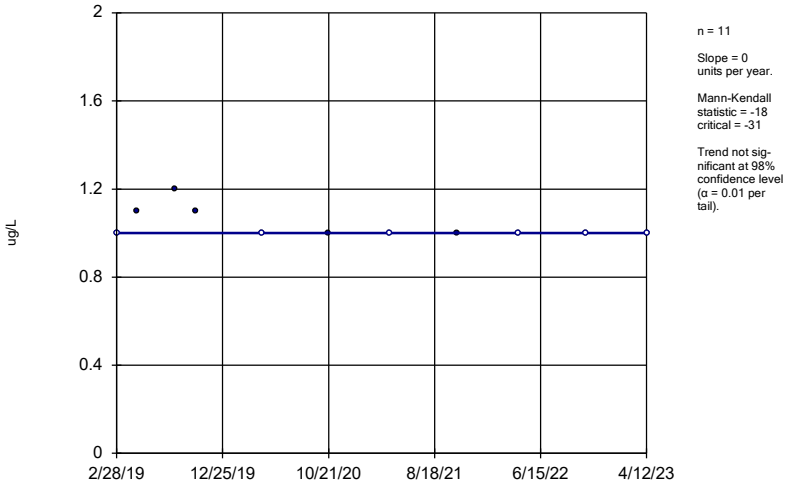
Sen's Slope Estimator Analysis Run 9/13/2023 4:18 PM

Client: Consumers Energy Data: 2Q23_JHC_Sanitas

Hollow symbols indicate censored values.

Arsenic, Total

JHC-MW-18004



n = 11

Slope = 0 units per year.

Mann-Kendall statistic = -18 critical = -31

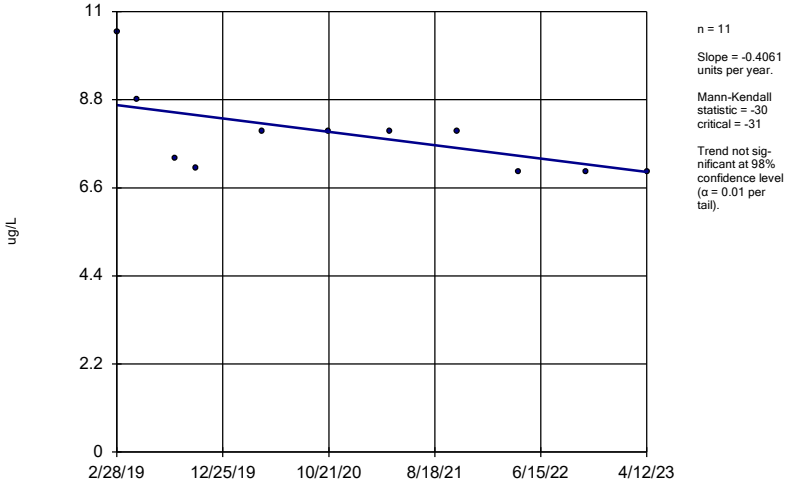
Trend not significant at 98% confidence level (α = 0.01 per tail).

Sen's Slope Estimator Analysis Run 9/13/2023 4:18 PM

Client: Consumers Energy Data: 2Q23_JHC_Sanitas

Arsenic, Total

JHC-MW-18005



n = 11

Slope = -0.4061 units per year.

Mann-Kendall statistic = -30 critical = -31

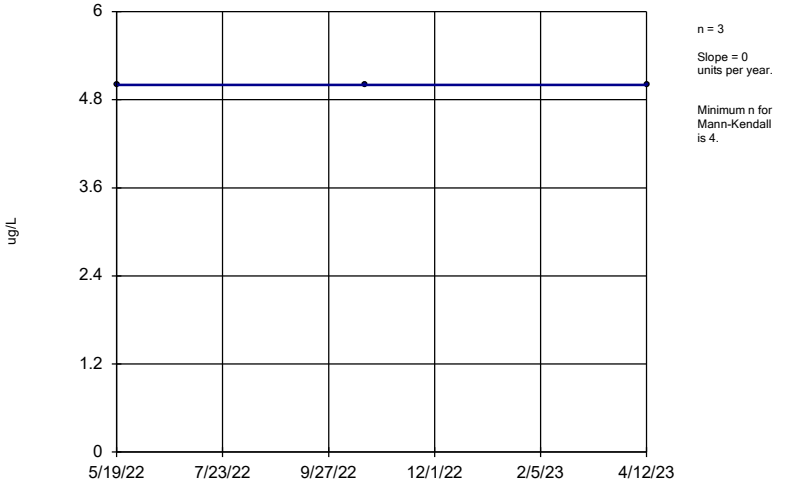
Trend not significant at 98% confidence level (α = 0.01 per tail).

Sen's Slope Estimator Analysis Run 9/13/2023 4:18 PM

Client: Consumers Energy Data: 2Q23_JHC_Sanitas

Arsenic, Total

JHC-MW-22001



n = 3

Slope = 0 units per year.

Minimum n for Mann-Kendall is 4.

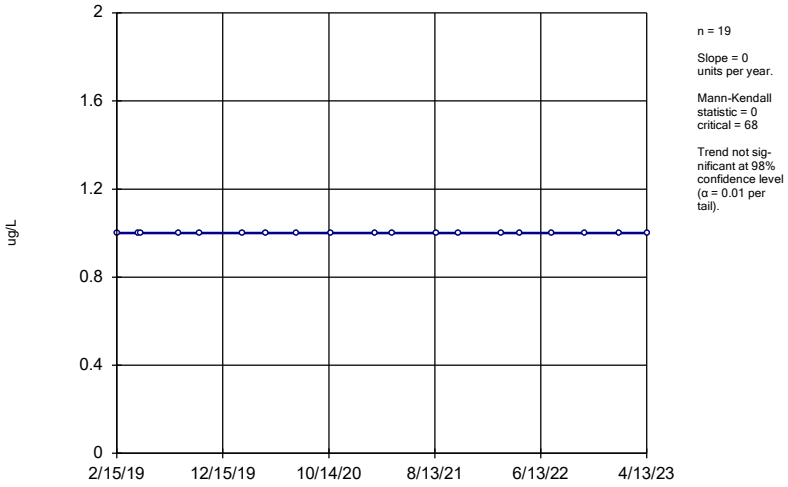
Sen's Slope Estimator Analysis Run 9/13/2023 4:18 PM

Client: Consumers Energy Data: 2Q23_JHC_Sanitas

Hollow symbols indicate censored values.

Arsenic, Total

PZ-23S



n = 19

Slope = 0 units per year.

Mann-Kendall statistic = 0 critical = 68

Trend not significant at 98% confidence level (α = 0.01 per tail).

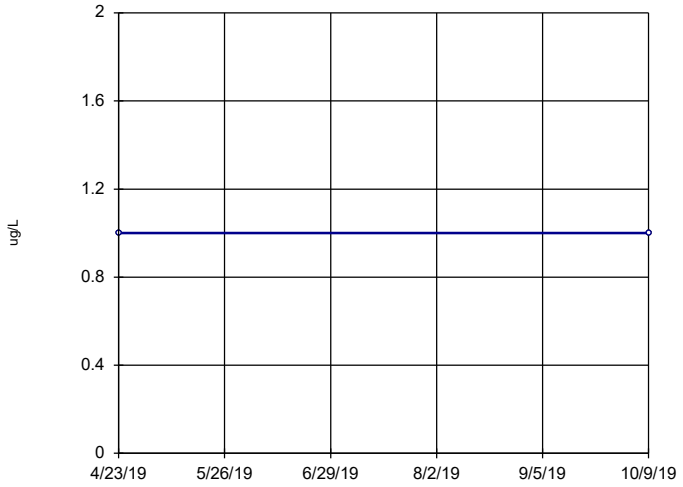
Sen's Slope Estimator Analysis Run 9/13/2023 4:18 PM

Client: Consumers Energy Data: 2Q23_JHC_Sanitas

Sanitas™ v.9.6.37 Sanitas software licensed to Consumers Energy. UG
Hollow symbols indicate censored values.

Arsenic, Total

PZ-23D



n = 2

Slope = 0 units per year.

Minimum n for Mann-Kendall is 4.

Sen's Slope Estimator Analysis Run 9/13/2023 4:18 PM

Client: Consumers Energy Data: 2Q23_JHC_Sanitas

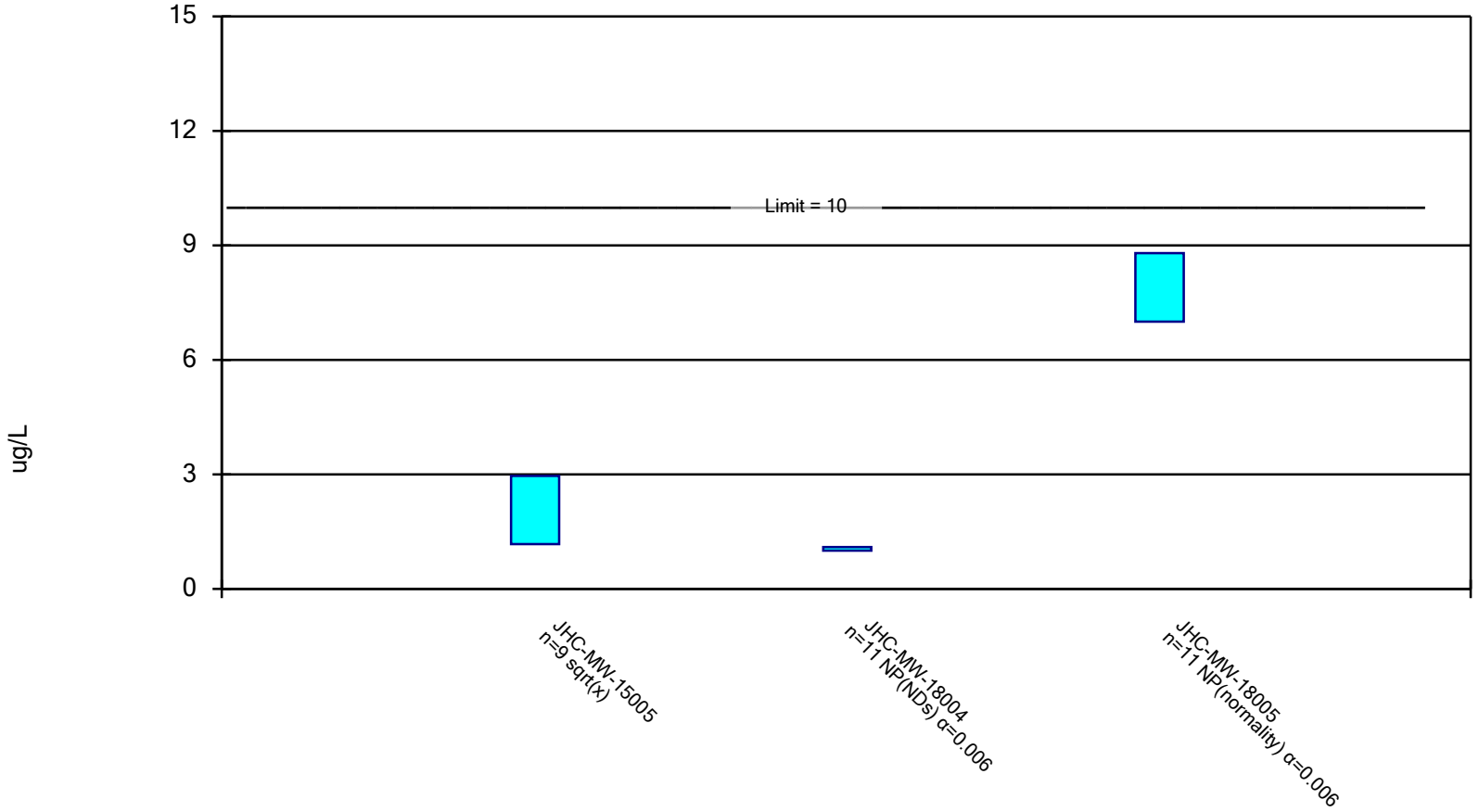
Shapiro-Wilk Normality Test

Constituent: Arsenic, Total Analysis Run 9/13/2023 9:06 AM
Client: Consumers Energy Data: 2Q23_JHC_Sanitas

Well	Transformation	Calculated	Critical	Normal
JHC-MW-15005 (n = 9, alpha = 0.1)				
	no	0.8013	0.859	No
	square root	0.8736	0.859	Yes
	square	0.6431	0.859	No
	cube root	0.8927	0.859	Yes
	cube	0.5289	0.859	No
	natural log	0.9205	0.859	Yes
	x^4	0.4634	0.859	No
	x^5	0.4286	0.859	No
	x^6	0.4104	0.859	No
JHC-MW-18004 (n = 11, alpha = 0.05)				
	no	0.6192	0.85	No
	square root	0.6206	0.85	No
	square	0.6159	0.85	No
	cube root	0.621	0.85	No
	cube	0.6117	0.85	No
	natural log	0.6218	0.85	No
	x^4	0.6068	0.85	No
	x^5	0.601	0.85	No
	x^6	0.5944	0.85	No
JHC-MW-18005 (n = 11, alpha = 0.05)				
	no	0.7962	0.85	No
	square root	0.8138	0.85	No
	square	0.7568	0.85	No
	cube root	0.8193	0.85	No
	cube	0.7136	0.85	No
	natural log	0.8297	0.85	No
	x^4	0.6691	0.85	No
	x^5	0.6257	0.85	No
	x^6	0.5849	0.85	No
PZ-23S (n = 19, alpha = 0.05)				
	no	-1	0.901	No
	square root	-1	0.901	No
	square	-1	0.901	No
	cube root	-1	0.901	No
	cube	-1	0.901	No
	natural log	-1	0.901	No
	x^4	-1	0.901	No
	x^5	-1	0.901	No
	x^6	-1	0.901	No

Parametric and Non-Parametric (NP) Confidence Interval

Compliance Limit is not exceeded. Per-well alpha = 0.01 except as noted. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Arsenic, Total Analysis Run 8/16/2023 1:53 PM

Client: Consumers Energy Data: 2Q23_JHC_Sanitas

Confidence Interval

Constituent: Arsenic, Total (ug/L) Analysis Run 8/16/2023 1:54 PM

Client: Consumers Energy Data: 2Q23_JHC_Sanitas

	JHC-MW-15005	JHC-MW-18004	JHC-MW-18005
2/28/2019		<1	10.5 (D)
4/25/2019	1.15 (D)	1.1	8.8
8/13/2019		1.2	7.35 (D)
10/9/2019	1.4	1.1	7.1
4/16/2020	1	<1	8
10/22/2020	2	1	8 (D)
4/13/2021	2.5 (D)	<1	8
10/21/2021	2		
10/22/2021		1	8
4/13/2022	2	<1	7 (D)
10/20/2022	4.5 (D)	<1	7
4/12/2023	2	<1	7
Mean	2.061	1.036	7.886
Std. Dev.	1.034	0.06742	1.048
Upper Lim.	2.957	1.1	8.8
Lower Lim.	1.174	1	7

ND substitution: RL or RL/2 if <15% NDs.

Non-Parametric Confidence Interval

Compliance Limit is not exceeded. Per-well alpha = 0.01.

Constituent: Arsenic, Total Analysis Run 8/16/2023 1:55 PM

Client: Consumers Energy Data: 2Q23_JHC_Sanitas

Confidence Interval

Constituent: Arsenic, Total (ug/L) Analysis Run 8/16/2023 1:55 PM

Client: Consumers Energy Data: 2Q23_JHC_Sanitas

	PZ-23S
2/15/2019	<1
4/17/2019	<1
4/23/2019	<1 (D)
8/12/2019	<1
10/9/2019	<1 (D)
2/11/2020	<1
4/16/2020	<1
7/15/2020	<1
10/21/2020	<1
2/23/2021	<1
4/14/2021	<1
8/17/2021	<1
10/21/2021	<1
2/22/2022	<1
4/13/2022	<1
7/15/2022	<1
10/19/2022	<1 (D)
1/25/2023	<1
4/13/2023	<1
Mean	1
Std. Dev.	0
Upper Lim.	1
Lower Lim.	1

ND substitution: RL or RL/2 if <15% NDs.

Attachment 4
Qualified Professional Engineering Certification

Consumers Energy
Count on Us®

A CMS Energy Company

Date: September 15, 2023

To: Operating Record

From: Harold D. Register, Jr., P.E.

RE: Remedy Completion Professional Engineer Certification, 40 CFR §257.98(e)
JH Campbell Unit 1&2 Bottom Ash Pond CCR Unit

Professional Engineer Certification Attestation [40 CFR §257.98(e)]

I, Harold D. Register, Jr., being a Registered Professional Engineer in the State of Michigan do hereby attest to the best of my knowledge, information, and belief that the remedy selected for corrective measures pursuant to 40 CFR §257.97 at the JH Campbell Unit 1&2 Bottom Ash Pond CCR unit has been completed in compliance with the requirements of 40 CFR §257.98(c) of the Federal CCR Rule as detailed in *JH Campbell Ponds 1-2 North and 1-2 South Coal Combustion Residual (CCR) 40 CFR 257.98(e) Completion of Remedy Letter Report*.

Harold D. Register, Jr.

Signature

September 15, 2023

Date of Certification

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

Name

6201056266

Professional Engineer Certification Number

09/15/2023

References

Consumers Energy (September 2023). *JH Campbell Ponds 1-2 North and 1-2 South Coal Combustion Residual (CCR) 40 CFR 257.98(e) Completion of Remedy Letter Report.*

Attachment 5
References

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