2023 Annual Groundwater Monitoring and Corrective Action Report

JH Campbell Power Plant
Ponds 1-2 North and 1-2 South CCR Unit

West Olive, Michigan

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Executive Summary

On behalf of Consumers Energy, TRC has prepared this report for the JH Campbell Ponds 1-2 Coal Combustion Residual (CCR) unit to cover the period of January 1, 2023 to December 31, 2023. Ponds 1-2 was in assessment monitoring at the beginning of the period covered by this report and had completed corrective actions at the end of the reporting period. This report presents the assessment monitoring program data that have been collected and evaluated in 2023, documents corrective action activities taken in 2023, and marks the conclusion of groundwater monitoring and corrective action reporting under §257.90(e).

Consumers Energy first reported the potential for statistically significant increases (SSIs) for Appendix III constituents in the *Annual Groundwater Monitoring Report, JH Campbell Power Plant, Unit 1-2 North and 1-2 South CCR Unit*. On April 25, 2018, Consumers Energy entered assessment monitoring upon determining that an Alternate Source Demonstration for the SSIs for Appendix III constituents was not successful. After subsequent sampling for Appendix IV constituents, Consumers Energy provided notification in the *Notification of Appendix IV Constituent Exceeding Groundwater Protection Standard per §257.95(g)* that arsenic was present at statistically significant levels above the federal groundwater protection standard (GWPS) established at 10 ug/L in two out of five downgradient monitoring wells at Ponds 1-2 as follows:

- Arsenic at JHC-MW-15002 and JHC-MW-15003.

The *Assessment of Corrective Measures* (ACM) was initiated on April 14, 2019 and was certified and submitted to the Michigan Department of Environment, Great Lakes, and Energy (EGLE) on September 11, 2019 in accordance with the schedule in §257.96. The ACM documents that the groundwater nature and extent has been defined, as required in §257.95(g)(1). Although arsenic concentrations exceed the GWPS in on-site groundwater, the property containing the site is owned and operated by Consumers Energy and on-site groundwater is not used for drinking water.

Overall, the statistical evaluations have confirmed that arsenic is the only Appendix IV constituent present at statistically significant levels above the GWPSs associated with the former Ponds 1-2 CCR Unit. However, those statistically significant levels of arsenic above the GWPS are limited to monitoring wells no longer downgradient from Ponds 1-2 that are influenced by the long operational history of ash management in this area of the site. All of the arsenic concentrations in groundwater during the 2023 monitoring period are below the GWPS within the current monitoring network (certified January 2023) and the nature and extent wells installed in the interior of the Ponds 1-2 footprint. Groundwater monitoring downgradient from Ponds 1-2 further demonstrate that there are currently no adverse effects on human health or the environment from either surface water or groundwater due to the historical CCR management at Ponds 1-2.

Closure by removal has been completed at Ponds 1-2 in accordance with §257.102(c). Remedy selection for Ponds 1-2, prescribed by the CCR Rule, was undertaken in coordination with the EGLE Consent Agreement WMRPD No. 115-01-2018, which was executed on December 28, 2018. CCR removal activities at Ponds 1-2 were completed in October 2018 and

on October 22, 2019, the EGLE provided written concurrence that all bottom ash had been removed from Ponds 1-2 based on multiple lines of evidence described in the approved closure work plan. Consumers Energy completed the final remedy selection in July 2023, certified the completion of the selected remedy in September 2023, followed by the closure by removal certification in late September 2023. Therefore, as of September 2023, Ponds 1-2 was deemed a closed CCR unit under 40 CFR §257. Accordingly, the CCR unit is not subject to post-closure care requirements or any other requirements under 40 CFR §257 of the CCR Rule. Therefore, ongoing assessment and post-remedy (i.e., corrective action) monitoring was concluded at Ponds 1-2 in 2023 and no further monitoring activities for Ponds 1-2 are planned at this time.

1.0 Introduction

On April 17, 2015, the United States Environmental Protection Agency (USEPA) published the final rule for the regulation and management of Coal Combustion Residuals (CCR) under the Resource Conservation and Recovery Act (RCRA) (the CCR Rule) (USEPA, April 2015 as amended). Standards for groundwater monitoring and corrective action codified in the CCR Rule (40 CFR 257.90 – 257.98), apply to the Consumers Energy Company (Consumers Energy) Ponds 1-2 North and 1-2 South bottom ash pond CCR Unit at the JH Campbell Power Plant Site (Ponds 1-2). Pursuant to the CCR Rule, no later than January 31, 2018, and annually thereafter, the owner or operator of a CCR unit must prepare an annual groundwater monitoring and corrective action report for the CCR unit documenting the status of groundwater monitoring and corrective action for the preceding year in accordance with §257.90(e).

On behalf of Consumers Energy, TRC has prepared this Annual Groundwater Monitoring and Corrective Action Report (Annual Report) for Ponds 1-2 to cover the period of January 1, 2023 to December 31, 2023. Ponds 1-2 was in assessment monitoring at the beginning of the period covered by this report. Closure by removal has been completed at Ponds 1-2. Consumers Energy completed the final remedy selection in July 2023, certified the completion of the selected remedy in September 2023, followed by the closure by removal certification in late September 2023. With the final closure of Ponds 1-2 complete, Consumers Energy has completed the self-implementing groundwater compliance program in conformance with §257.90 - §257.98 and assessment monitoring is no longer required.

Therefore, following the formal certification of closure, Ponds 1-2 were removed from assessment monitoring. Accordingly, only one semiannual assessment monitoring event was conducted for Ponds 1-2 during the 2023 reporting period. This monitoring report presents the assessment monitoring program data that were collected and evaluated in 2023, documents corrective action activities taken in 2023, and marks the conclusion of groundwater monitoring and corrective action reporting under §257.90(e).

1.1 Program Summary

Consumers Energy first reported the potential for statistically significant increases (SSIs) for Appendix III constituents in the *Annual Groundwater Monitoring Report, JH Campbell Power Plant, Unit 1-2 North and 1-2 South CCR Unit* (2017 Annual Report) (TRC, January 2018). As discussed in the *2018 Annual Groundwater Monitoring Report for the JH Campbell Power Plant Units 1-2 North and 1-2 South CCR Unit* (2018 Annual Report) (TRC, January 2019), Consumers Energy entered assessment monitoring on April 25, 2018, upon determining that an Alternate Source Demonstration for the Appendix III constituents was not successful. After subsequent sampling for Appendix IV constituents, Consumers Energy provided notification in the *Notification of Appendix IV Constituent Exceeding Groundwater Protection Standard per §257.95(g)* (Consumers Energy, January 2019) that arsenic was present at statistically significant levels above the federal groundwater protection standard (GWPS) established at 10 ug/L in two out of five downgradient monitoring wells at Ponds 1-2 as follows:

- Arsenic at JHC-MW-15002 and JHC-MW-15003.

The CCR Rule 40 CFR §257.96(a) requires that an owner or operator initiate an assessment of corrective measures to prevent further release, to remediate any releases, and to restore impacted areas to original conditions if any Appendix IV constituent has been detected at a statistically significant level exceeding a GWPS. The *Assessment of Corrective Measures* report (ACM) (TRC, September 2019) was initiated on April 14, 2019, and was certified and submitted on September 11, 2019, in accordance with the schedule in §257.96.

The ACM documents that the groundwater nature and extent has been defined, as required in §257.95(g)(1), based on the site-specific hydrogeology and data collected from existing monitoring wells. Although arsenic concentrations exceed the GWPS in on-site groundwater, an evaluation of risk demonstrates that there are currently no adverse effects on human health or the environment from either surface water or groundwater due to CCR management at Ponds 1-2. Groundwater data collected from 2018 through 2023, as presented in the 2018 through 2023 Annual Reports, demonstrate that the Ponds 1-2 source removal was effective.

On July 21, 2023, Consumer Energy 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) (Consumers Energy, July 2023) that identified Source Removal with Post Remedy Monitoring as the selected remedy pursuant to §257.97 to address the potential for residual arsenic in groundwater associated with Ponds 1-2 activities. As described in the September 15, 2023 *JH Campbell Ponds 1-2 North and 1-2 South Coal Combustion Residual (CCR) Unit 40 CFR 257.98(e) Completion of Remedy Letter Report* (Remedy Completion Report) (Consumers Energy, September 2023a), the selected remedy was certified as complete upon meeting the GWPS consecutively for three years.

On September 29, 2023, Consumers Energy certified that closure by removal has been completed in accordance with §257.102(c) as documented in the *JH Campbell Unit 1-2 Bottom Ash Pond North/South 40 CFR 257.102(c) Closure by Removal Certification* (Closure by Removal Certification) (Consumers Energy, September 2023b). Therefore, ongoing assessment and post-remedy (i.e., corrective action) monitoring was concluded at Ponds 1-2 in 2023.

1.2 Site Overview

The JH Campbell Power Plant is a coal fired power generation facility located in West Olive, Michigan, on the eastern shore of Lake Michigan. It is bordered by the Pigeon River on the south, 156th Avenue on the east, and Croswell Street to the north with Lakeshore Drive bisecting the site from north to south. The power generating plant consists of three coal fired electric generating units located on the western side of the site and the CCR disposal area is on the east side of the site, east of Lakeshore Drive. Figure 1 is a site location map showing the facility and the surrounding area.

Currently, there are no remaining active CCR surface impoundments at the JH Campbell solid waste disposal facility. The CCR surface impoundments located within the former wet ash pond area are Ponds 1-2, Pond 3 North and Pond 3 South Bottom Ash Pond (collectively Pond 3), and Pond A. Site features are shown on Figure 2. The surface impoundments in the wet ash

pond areas were decommissioned and CCR removed throughout 2017 and 2018 and were replaced with concrete bottom ash treatment tanks. Dry ash from all of the generating units is stored in silos until it is placed into the Dry Ash Landfill or is sold and shipped off site.

This report focuses on the Ponds 1-2 CCR Unit.

1.3 Geology/Hydrogeology

Groundwater is typically encountered at elevations (NAVD 88) ranging from 604 feet near the background wells (located to the north-northwest of the Dry Ash Landfill) to 590 feet along the southeast corner of the Dry Ash Landfill and south of the former Ponds 1-2 and Pond A CCR surface impoundments and generally flows to the south-southeast toward the Pigeon River. The subsurface materials encountered at the JH Campbell site generally consist of approximately 40 to 60 feet of poorly graded, fine-grained lacustrine sand. A laterally extensive clay-rich till is generally encountered within approximately 40 to 60 ft bgs across the site that according to deep drilling logs conducted at the JH Campbell Power Plant (just west of the CCR units) is on the order of 80 feet thick and extends to the top of shale bedrock approximately 140 ft bgs.

2.0 Groundwater Monitoring

2.1 Monitoring Well Network

In accordance with 40 CFR 257.91, Consumers Energy has established a groundwater monitoring system for Ponds 1-2, which currently consists of 9 monitoring wells (6 background monitoring wells and 3 downgradient monitoring wells) that are screened in the uppermost aquifer. The monitoring well locations are shown on Figure 2.

Six monitoring wells located north-northwest of the Dry Ash Landfill provide data on background groundwater quality that has not been affected by the CCR units (JHC-MW-15023 through JHC-MW-15028). Background groundwater quality data from these six background wells are additionally used for the CCR groundwater monitoring program at three other JH Campbell CCR units.

As documented in the *2022 Annual Groundwater Monitoring and Corrective Action Report* (2022 Annual Report) (TRC, January 2023), due to the cessation of hydraulic loading and decommissioning of Ponds 1-2, the groundwater flow direction changed significantly from the previous baseline and assessment monitoring events such that groundwater flow is generally toward the south at Ponds 1-2 as opposed to radially away from the ponds as observed during baseline monitoring. Former downgradient monitoring wells JHC-MW-15002 and JHC-MW-15003, are now located side gradient of Ponds 1-2. Additionally, the *Alternative Source Demonstration: Selenium at JHC-MW-15005* (October 2021 ASD) (TRC, October 2021), confirmed the presence of CCRs at JHC-MW-15002 and JHC-MW-15003 and established that groundwater chemistry and quality is being influenced by historical Ponds B-K at JHC-MW-15005 located immediately downgradient from JHC-MW-15002 and JHC-MW-15003.

In response to the determination that downgradient monitoring well JHC-MW-15005 on the eastern side of Ponds 1-2 is not appropriate to assess downgradient groundwater quality associated with Ponds 1-2, and to maintain a minimum of three downgradient monitoring wells, Consumers Energy installed a new monitoring well (JHC-MW-22001) on May 12, 2022. The updated Ponds 1-2 monitoring network certification was included in the 2022 Annual Report. The certified Ponds 1-2 monitoring network consists of the following:

- Background Monitoring Wells:
  - JHC-MW-15023 through JHC-MW-15028
- Downgradient Monitoring Wells:
  - JHC-MW-18004
  - JHC-MW-18005
  - JHC-MW-22001

No changes were made to the Ponds 1-2 well network in 2023.

As shown on Figure 2, monitoring wells JHC-MW-15029 and JHC-MW-15030 are used for water level measurements only. Static water level data are collected at additional wells at the JH Campbell CCR units and used to inform the site-wide groundwater contour map.

2.2 Semiannual Groundwater Monitoring

Per §257.95, all wells in the CCR unit monitoring program must be sampled at least semiannually and analyzed for the full list of constituents from Appendix III and Appendix IV during at least one semiannual event. However, Ponds 1-2 was closed in accordance with §257.102(c) in September 2023 and ongoing assessment monitoring was discontinued. In accordance with §257.104(a)(2), Ponds 1-2 is not subject to the post-closure care criteria given that the CCR unit was closed by removing CCR as provided by §257.102(c). Therefore, with the final closure of Ponds 1-2 having been certified complete, assessment monitoring per §257.95 is no longer required. Accordingly, only one semiannual assessment monitoring event was completed for Ponds 1-2 during the 2023 reporting period.

During the semiannual monitoring event, the full list of Appendix III and IV constituents were analyzed in addition to collecting field parameters including dissolved oxygen, oxidation reduction potential, specific conductivity, temperature, and turbidity at each well. Samples were collected and analyzed in accordance with the *Sample Analysis Plan for JH Campbell Ponds 1-2 and Pond 3* (SAP) (TRC, January 2021).

2.2.1 Data Summary

The groundwater assessment monitoring event was performed on April 10 through 13, 2023. The sample collection was performed by Consumers Energy and samples were analyzed by Consumers Energy Laboratory Services in Jackson, Michigan, with radium samples analyzed by Eurofins Environmental Testing in St Louis, Missouri, in accordance with the SAP. Static water elevation data were collected at all monitoring well locations. Groundwater samples were collected from the background monitoring wells and Ponds 1-2 monitoring wells for the Appendix III and Appendix IV constituents and field parameters.

A summary of the groundwater data collected during the April 2023 event is provided on Table 1 (static groundwater elevation data), Table 2 (field data), Table 3 (background well analytical results), and Table 4 (Ponds 1-2 analytical results).

2.2.2 Data Quality Review

Data were evaluated for completeness, overall quality and usability, method-specified sample holding times, precision and accuracy, and potential sample contamination. The data were found to be complete and usable for the purposes of the CCR monitoring program. The data quality reviews are summarized in Appendix A.

2.2.3 Groundwater Flow Rate and Direction

Groundwater elevation data collected site-wide during the April 2023 assessment monitoring event were generally similar to data collected previously since the background sampling events

commenced in December 2015. The data showed that groundwater within the uppermost aquifer generally flows to the south-southeast across the Site, with a southwesterly groundwater flow component on the western edge of the Site. Groundwater flow in the immediate vicinity of Ponds 1-2 is predominately toward the south, consistent with previous assessment monitoring events. The groundwater mounding previously observed in the immediate vicinity of Ponds 1-2 and Pond 3 early on in the program is no longer present subsequent to completing decommissioning activities at both units in September and October 2018, respectively.

Groundwater elevations measured across the Site during the April 2023 event are provided on Table 1. April 2023 groundwater elevations were used to construct the groundwater contour map provided on Figure 3. The average hydraulic gradient for the April 2023 sampling event was calculated using the following well pairs: JHC-MW-15026/PZ-23S, JHC-MW-15017/PZ-24S, and JHC-MW-15024/JHC-MW-15031 (Figure 2). The average hydraulic gradient was 0.0037 ft/ft in April 2023. Using the mean hydraulic conductivity of 62 ft/day (ARCADIS, 2016) and an assumed effective porosity of 0.4, the estimated average seepage velocity was approximately 0.58 ft/day or 210 ft/year for the April 2023 event.

The general groundwater flow direction is similar to that identified in previous monitoring rounds post pond closure and continues to demonstrate that the downgradient wells are appropriately positioned to detect the presence of Appendix IV constituents downgradient from Ponds 1-2.

3.0 Statistical Evaluation

Assessment monitoring was performed at Ponds 1-2 while corrective measures were continuing to be evaluated in accordance with §257.96 and §257.97 as outlined in the ACM. The following section summarizes the statistical approach applied to assess the April 2023 groundwater data in accordance with the assessment monitoring program. The statistical evaluation details are provided in Appendix B (*Statistical Evaluation of April 2023 Assessment Monitoring Sampling Event*).

3.1 Establishing Groundwater Protection Standards

The Appendix IV GWPSs are used to assess whether Appendix IV constituent concentrations are present in groundwater at unacceptable levels as a result of CCR unit operations by statistically comparing concentrations in the downgradient wells to the GWPSs for each Appendix IV constituent. The calculation of the GWPSs is documented in the Groundwater Protection Standards technical memorandum included in Appendix C of the 2018 Annual Report.

3.2 Data Comparison to Groundwater Protection Standards

Consistent with the *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, Unified Guidance* (Unified Guidance) (USEPA, 2009), the preferred method for comparisons to a fixed standard are confidence limits. An exceedance of the standard occurs when the 99 percent lower confidence level of the downgradient data exceeds the GWPS. As documented in the January 14, 2019 *Notification of Appendix IV Constituent Exceeding Groundwater Protection Standard per §257.95(g)* (Consumers Energy, January 2019), arsenic was present at statistically significant levels above the GWPSs in two of the downgradient wells at Ponds 1-2 based on the statistical data comparison for the initial semiannual assessment monitoring event (June 2018). Therefore, Consumers Energy initiated the ACM. Assessment monitoring was concluded following the final remedy completion certification on September 15, 2023 and final closure by removal certification on September 29, 2023.

Arsenic was identified at downgradient monitoring wells JHC-MW-15002 and JHC-MW-15003 at statistically significant levels exceeding the GWPS during the initial assessment monitoring event conducted in June 2018. Since entering assessment monitoring in 2018, the statistical evaluations at Ponds 1-2 have confirmed that arsenic is the only Appendix IV constituent present at statistically significant levels above the GWPSs not attributed to an alternative source. The locations of those statistically significant levels of arsenic above the GWPS have been limited to JHC-MW-15002 and JHC-MW-15003, which are no longer hydraulically downgradient from Ponds 1-2 and are also influenced by the long operational history of ash management in this area of the site. Accordingly, monitoring wells JHC-MW-15002 and JHC-MW-15003, along with monitoring well JHC-MW-15005 located immediately downgradient of JHC-MW-15002 and JHC-MW-15003, were removed from the certified monitoring well network. Arsenic concentrations in all the current downgradient monitoring wells, including JHC-MW-15005, have remained below the GWPS since entering assessment monitoring in 2018.

The results of the April 2023 statistical evaluation show that no Appendix IV constituents are present at statistically significant levels above the GWPSs in the downgradient monitoring well network. A summary of the confidence intervals for April 2023 is provided in Table 5.

4.0 Corrective Action and Final Remedy Completion

Consumers Energy provided notification per §257.95(g) in January 2019 and completed an assessment of corrective measures pursuant to §257.96 in response to arsenic present at statistically significant levels above the federal GWPS established at 10 ug/L in two out of five monitoring wells that were downgradient of Ponds 1-2 at the time as follows:

- Arsenic at JHC-MW-15002 and JHC-MW-15003

Five remedial approaches were evaluated based on source control by removing CCR in Ponds 1-2. Source removal was completed in 2018. Assessment monitoring was performed at Ponds 1-2 from 2018 to 2023 while corrective measures were continuing to be evaluated in accordance with §257.96 and §257.97. These data 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. Consumers Energy completed the final remedy selection in July 2023, certified the completion of the selected remedy in September 2023, followed by the closure by removal certification in late September 2023. This section provides an overview of corrective action activities for Ponds 1-2 performed in 2023.

4.1 Nature and Extent Groundwater Sampling

Per §257.95(g)(1), in the event that the facility determines, pursuant to §257.93(h), that there is a statistical exceedance of the GWPSs for one or more of the Appendix IV constituents, the facility must characterize the nature and extent of the release of CCR as well as any site conditions that may affect the remedy selected. The nature and extent data for Ponds 1-2 consist of Appendix III and IV constituents collected from the background and downgradient CCR monitoring well networks and from supplemental downgradient nature and extent wells as shown on Figure 2. In addition to the supplemental downgradient nature and extent wells, monitoring wells JHC-MW-15002, JHC-MW-15003, and JHC-MW-15005 are included as nature and extent monitoring wells to represent groundwater quality along the east edge of Ponds 1-2 that is influenced by the adjacent historical CCR management areas. The soil boring logs and well construction diagrams for the downgradient step out monitoring wells utilized for the nature and extent groundwater sampling are included in the *2019 Annual Groundwater Monitoring Report for the JH Campbell Power Plant Unit 1-2 North and 1-2 South CCR Unit* (2019 Annual Report) (TRC, January 2020).

To further characterize groundwater quality within the Ponds 1-2 footprint, immediately upgradient of the Ponds 1-2 downgradient wells and side gradient from the identified alternate source on the eastern edge of Ponds 1-2, Consumers Energy installed two monitoring wells (MW-22-14 and MW-22-15) in the interior of the former Ponds 1-2 area in November 2022. The soil boring logs and well construction diagrams for the Ponds 1-2 interior wells are included in Appendix F of the 2022 Annual Report. Monitoring wells MW-22-14 and MW-22-15 were sampled again in January 2023 to verify the 2022 groundwater results and further characterize groundwater quality directly beneath Ponds 1-2 and assess the effectiveness of the remedy. A summary of the nature and extent groundwater data collected in 2023 is provided on Table 6.

The additional round of data from monitoring wells MW-22-14 and MW-22-15 shows that groundwater quality directly beneath the former Ponds 1-2 footprint is well below the GWPSs for all of the Appendix IV constituents, which, along with the assessment monitoring results presented in Section 2.3, demonstrate that the CCR removal activities were effective in addressing arsenic concentrations associated with former Ponds 1-2 activities. As discussed in the ACM, the nature and extent of contamination (i.e. arsenic) in groundwater relative to GWPSs has been defined per the RCRA CCR Rule requirements based on the site-specific hydrogeology. The presence of nearby surface water bodies (Recirculation Pond and the Pigeon River) as well as the unimpacted background monitoring wells to the north provide the boundaries for the extent of the GWPS exceedances. In addition, the underlying clay unit prevents the downward vertical migration of groundwater.

Although Michigan Part 201 residential drinking water criteria are exceeded, there are no on-site drinking water wells downgradient from Ponds 1-2 and the closest downgradient drinking water wells are located south and east of the Pigeon River, separated hydraulically by the river. Shallow groundwater has the potential to vent to nearby surface water boundaries that are not used for drinking water. Although several Appendix III and IV constituents exceed the Michigan Part 201 generic groundwater-surface water interface (GSI) criteria in on-site wells, compliance for the GSI pathway is currently met based on data collected from the step out wells and the NPDES outfall at the Recirculation Pond.

4.2 Assessment of Corrective Measures

The CCR Rule 40 CFR §257.96(a) requires that an owner or operator initiate an assessment of corrective measures to prevent further release, to remediate any releases, and to restore impacted areas to original conditions if any Appendix IV constituent has been detected at a statistically significant level exceeding a GWPS. The ACM was initiated on April 14, 2019, and was certified and submitted to the EGLE on September 11, 2019, in accordance with the schedule in §257.96, as a step towards developing a final remedy.

Several groundwater remediation alternatives evaluated in the ACM were considered technically feasible to reduce on-site groundwater concentrations. The following corrective measures were retained for further evaluation for Ponds 1-2:

- Source Removal with Post Source Control/Removal Monitoring;
- Source Removal with Groundwater Capture/Control;
- Source Removal with Impermeable Barrier;
- Source Removal with Active Geochemical Sequestration; and
- Source Removal with Passive Geochemical Sequestration.

Consumers Energy followed an adaptive management strategy for selecting the final groundwater remedy for Ponds 1-2 in coordination with the specified CCR source material management strategies discussed in the ACM. Under this remedy selection strategy, measures that remove source material, reduce infiltration, and/or minimize the potential for future migration during the closure process were implemented to address existing conditions followed

by monitoring and evaluation of the performance after closure.

4.3 Remedy Selection and Completion

Remedy selection for Ponds 1-2, prescribed by the CCR Rule, was undertaken in coordination with EGLE Consent Agreement WMRPD No. 115-01-2018, which was executed on December 28, 2018. As outlined in the Remedy Selection Report (Consumers Energy, July 2023) posted to the operating record and the public facing CCR website on July 21, 2023, the final remedy selected for Ponds 1-2 was Source Removal with Post Remedy Monitoring, pursuant to §257.97, to address the potential for residual arsenic in groundwater associated with Ponds 1-2 activities. A public meeting was conducted on June 14, 2023, at least 30 days prior to the final remedy selection, as required under §257.96(e).

Ponds 1-2 underwent closure by removal of CCR in accordance with §257.102(c). Consumers Energy performed CCR removal at Ponds 1-2 as documented in the *JH Campbell Generating Facility Bottom Ash Ponds 1-2 Closure Plan,* (Golder, January 2018). The December 2017 *Bottom Ash Ponds 1-2 Closure Work Plan* was submitted to and approved by EGLE. 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 Consumers Energy submitted final documentation of CCR removal to EGLE in August 2019. On October 22, 2019, EGLE provided written concurrence that all bottom ash had been removed from Ponds 1-2 based on multiple lines of evidence described in the approved closure work plan. 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.

Groundwater data collected from 2018 through 2023 as presented in the 2018 through 2023 Annual Reports demonstrate 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. The statistical evaluations have confirmed that arsenic is the only Appendix IV constituent present at statistically significant levels above the GWPSs associated with the former Ponds 1-2 CCR Unit. However, those statistically significant levels above the GWPS are limited to monitoring wells no longer downgradient from Ponds 1-2 that are influenced by the long operational history of ash management in this area of the Site (i.e. JHC-MW-15002, JHC-MW-15003, and JHC-MW-15005). Results from monitoring wells MW-22-14 and MW-22-15 installed within the former Ponds 1-2 footprint are below the GWPS (Table 7 of the 2022 Annual Report and Table 6 of this 2023 Annual Report), indicate that source removal was effective in reducing arsenic concentrations below the GWPS beneath the former Ponds 1-2 area. Despite being influenced by other historical CCR management areas outside of the Ponds 1-2 footprint, arsenic groundwater concentrations at monitoring wells JHC-MW-15002 and JHC-MW-15003 have generally decreased since 2018, after dewatering and removal of ash at Ponds 1-2, as shown by the lower confidence limit of arsenic concentrations at JHC-MW-15003 that has remained below the GWPS since 2020 (Appendix D of the 2022 Annual Report), further supporting reduced arsenic concentrations following Ponds 1-2 closure in comparison to when Ponds 1-2 were active.

The selected remedy was certified as complete upon meeting the GWPS consecutively for three years. Additional details on the attainment of the GWPS are further detailed in the Remedy Completion Report (Consumers Energy, September 2023a) that was posted to the operating record and the public-facing CCR website by Consumers Energy on September 15, 2023 and includes the professional engineer certification that the remedy was completed in compliance with §257.98(c).

4.4 Closure by Removal Certification

On September 29, 2023, Consumers Energy certified that closure by removal has been completed in accordance with §257.102(c) as documented in the Closure by Removal Certification (Consumers Energy, September 2023b). As of the certification date of the Closure by Removal Certification, Ponds 1-2 was deemed a closed CCR unit under 40 CFR §257. Accordingly, the CCR unit is not subject to post-closure care requirements or any other requirements under 40 CFR §257 of the CCR Rule. Therefore, ongoing assessment and post-remedy (i.e., corrective action) monitoring was concluded at Ponds 1-2 in 2023.

5.0 Conclusions

Assessment monitoring was performed at the Ponds 1-2 CCR unit through April 2023 while corrective action continued to be assessed. Closure by removal has been completed at Ponds 1-2 in accordance with §257.102(c). Consumers Energy completed the final remedy selection in July 2023, certified the completion of the selected remedy in September 2023, followed by the closure by removal certification in late September 2023. Therefore, as of September 2023, Ponds 1-2 was deemed a closed CCR unit under 40 CFR §257. Accordingly, the CCR unit is not subject to post-closure care requirements or any other requirements under 40 CFR §257 of the CCR Rule. Therefore, ongoing assessment and post-remedy (i.e., corrective action) monitoring was concluded at Ponds 1-2 in 2023 and no further monitoring activities for Ponds 1-2 are planned at this time.

6.0 References

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Tables

Table 1
Summary of Groundwater Elevation Data
JH Campbell – RCRA CCR Monitoring Program
West Olive, Michigan

Well Location	Ground Surface Elevation (ft)	TOC Elevation (ft)	Geologic Unit of Screen Interval	Screen Interval Elevation (ft)			April 10, 2023	
							Depth to Water (ft BTOC)	Groundwater Elevation (ft)
Background								
JHC-MW-15023	617.01	619.98	Sand	603.0	to	593.0	16.57	603.41
JHC-MW-15024	613.79	616.62	Sand	606.8	to	596.8	12.41	604.21
JHC-MW-15025	614.14	617.17	Sand	607.1	to	597.1	11.87	605.30
JHC-MW-15026	615.09	618.04	Sand	607.1	to	597.1	14.02	604.02
JHC-MW-15027	614.77	617.30	Sand	604.8	to	594.8	14.63	602.67
JHC-MW-15028	611.02	613.80	Sand	603.0	to	593.0	14.33	599.47
JHC-MW-15029	608.08	610.95	Sand	600.1	to	590.1	11.54	599.41
JHC-MW-15030	604.05	607.17	Sand	600.1	to	590.1	9.15	598.02
Pond 1N, 1S, 2N, 2S								
JHC-MW-15001	607.02	609.53	Sand	603.5	to	598.5	NM	
JHC-MW-15002	618.18	621.27	Sand	590.2	to	580.2	24.50	596.77
JHC-MW-15003	623.16	627.20	Sand	595.2	to	585.2	32.69	594.51
JHC-MW-15005	606.22	609.99	Sand	579.2	to	569.2	18.13	591.86
JHC-MW-18004	602.92	605.72	Sand	596.9	to	586.9	11.37	594.35
JHC-MW-18005	600.30	603.16	Sand	595.3	to	585.3	10.30	592.86
JHC-MW-22001	601.52	604.28	Sand	596.5	to	586.5	10.68	593.60
Pond 3N, 3S								
JHC-MW-15013	632.40	635.25	Sand	604.4	to	594.4	35.39	599.89
JHC-MW-15015	632.46	635.20	Sand	604.5	to	594.5	34.96	600.24
JHC-MW-15016	631.81	632.52	Sand	603.8	to	593.8	32.42	600.10
JHC-MW-18001	609.09	611.98	Sand	603.1	to	593.1	12.26	599.72
JHC-MW-18002	605.53	608.93	Sand	602.0	to	592.0	9.09	599.84
JHC-MW-18003	605.36	608.78	Sand	601.9	to	591.9	9.00	599.78
Landfill								
JHC-MW-15017	613.69	616.61	Sand	603.7	to	593.7	15.90	600.71
JHC-MW-15018	614.26	617.02	Sand	604.3	to	594.3	16.67	600.35
JHC-MW-15022	620.92	623.79	Sand	597.9	to	587.9	NM	
JHC-MW-15031	632.94	635.87	Sand	599.9	to	589.9	43.20	592.67
JHC-MW-15032	611.32	614.29	Sand	598.3	to	588.3	16.02	598.27
JHC-MW-15033	618.08	620.99	Sand	602.1	to	592.1	NM	
JHC-MW-15034	612.90	615.97	Sand	601.9	to	591.9	14.59	601.38
JHC-MW-15035	632.53	634.28	Sand	599.5	to	589.5	40.84	593.44
JHC-MW-15036	617.94	618.34	Sand	597.9	to	587.9	26.49	591.85
JHC-MW-15037	614.28	616.06	Sand	591.3	to	586.3	24.68	591.38
MW-B3	630.51	634.17	Sand	598.5	to	593.5	38.53	595.64
MW-B4	633.80	635.67	Sand	593.8	to	588.8	41.28	594.39
Pond A								
JHC-MW-15006	624.74	627.58	Sand	599.7	to	589.7	34.39	593.19
JHC-MW-15007R[(2)]	625.73	628.26	Sand	595.7	to	585.7	35.33	592.93
JHC-MW-15008R[(1)]	632.32	634.67	Sand	597.3	to	587.3	42.25	592.42
JHC-MW-15009R[(2)]	632.15	635.05	Sand	595.2	to	585.2	42.55	592.5
JHC-MW-15011R[(2)]	627.73	629.79	Sand	594.7	to	584.7	36.94	592.85
Downgradient Wells								
MW-13	593.40	595.37	Clayey Silt	587.9	to	585.4	Dry	
MW-14S	587.36	590.98	Sand	582.9	to	577.9	10.74	580.24
PZ-23S	602.84	604.97	Sand	591.8	to	586.8	14.72	590.25
PZ-24S	586.56	590.15	Sand	584.6	to	579.6	7.33	582.82
PZ-40S	589.51	593.25	Sand	585.5	to	575.5	10.16	583.09
TW-19-05	603.44	606.36	Sand	592.8	to	587.8	14.86	591.50
TW-19-06A	599.61	602.54	Sand	592.3	to	587.3	11.91	590.63

Notes:

Survey conducted by Nederveld, November 2015, October 2018, December 2018, August 2019, and July 2021.

Elevation in feet relative to North American Vertical Datum 1988 (NAVD 88).

TOC: Top of well casing.

ft BTOC: Feet below top of well casing.

NM: Not measured

(1) JHC-MW-15008R installed in June 2019.

(2) JHC-MW-15007R, JHC-MW-15009R, and JHC-MW-15011R installed in July 2021.

Table 2
Summary of Field Parameters
JH Campbell Ponds 1-2N/1-2S - RCRA CCR Monitoring Program
West Olive, Michigan

Sample Location	Sample Date	Dissolved Oxygen (mg/L)	Oxidation Reduction Potential (mV)	pH (SU)	Specific Conductivity (umhos/cm)	Temperature (°C)	Turbidity (NTU)
Background							
JHC-MW-15023	4/13/2023	4.42	245.3	5.3	111	12.8	4.1
JHC-MW-15024	4/13/2023	2.73	163.3	7.6	349	11.6	3.8
JHC-MW-15025	4/12/2023	6.16	129.1	7.6	239	10.8	5.5
JHC-MW-15026	4/13/2023	7.73	234.8	5.8	32	11.2	4.3
JHC-MW-15027	4/13/2023	8.75	227.4	6.2	129	10.5	4.9
JHC-MW-15028	4/12/2023	6.81	134.3	8.1	129	10.7	6.4
Ponds 1 & 2							
JHC-MW-15002	4/12/2023	1.55	56.9	6.7	1,086	14.8	5.9
JHC-MW-15003	4/12/2023	0.54	-27.6	7.3	790	13.8	1.0
JHC-MW-15005	4/12/2023	6.89	110.6	7.1	484	11.0	1.0
JHC-MW-18004	4/12/2023	5.16	117.4	7.4	534	11.7	2.6
JHC-MW-18005	4/12/2023	4.24	76.6	8.5	471	10.7	1.7
JHC-MW-22001	4/12/2023	2.10	70.7	8.2	535	11.8	2.2

Notes:

mg/L - Milligrams per Liter.

mV - Millivolts.

SU - Standard Units.

umhos/cm - Micromhos per centimeter.

°C - Degrees Celsius.

NTU - Nephelometric Turbidity Unit.

Table 3
Summary of Groundwater Sampling Results (Analytical)
JH Campbell Background – RCRA CCR Monitoring Program
West Olive, Michigan

						Sample Location:	JHC-MW-15023	JHC-MW-15024	JHC-MW-15025	JHC-MW-15026	JHC-MW-15027	JHC-MW-15028
						Sample Date:	4/13/2023	4/13/2023	4/12/2023	4/13/2023	4/13/2023	4/12/2023
Constituent	Unit	EPA MCL	MI Residential*	MI Non-Residential*	MI GSI^							
Appendix III(1)												
Boron	ug/L	NC	500	500	7,200		29	< 20	< 20	< 20	< 20	< 20
Calcium	mg/L	NC	NC	NC	500EE		12.7	33.1	20.4	2.98	15.3	16.3
Chloride	mg/L	250**	250E	250E	500EE		3.81	24.1	17.1	1.27	< 1.00	< 1.00
Fluoride	ug/L	4,000	NC	NC	NC		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	250**	250E	250E	500EE		14.4	9.14	6.29	5.78	4.71	5.15
Total Dissolved Solids	mg/L	500**	500E	500E	500		97	176	114	50	81	60
pH, Field	SU	**6.5 - 8.5****	**6.5 - 8.5E**	**6.5 - 8.5E**	**6.5 - 9.0**		**5.3**	7.6	7.6	**5.8**	**6.2**	8.1
Appendix IV(1)												
Antimony	ug/L	6	6.0	6.0	130		< 1	< 1	< 1	< 1	< 1	< 1
Arsenic	ug/L	10	10	10	10		< 1	< 1	< 1	< 1	< 1	< 1
Barium	ug/L	2,000	2,000	2,000	820		59	18	6	7	37	7
Beryllium	ug/L	4	4.0	4.0	18		< 1	< 1	< 1	< 1	< 1	< 1
Cadmium	ug/L	5	5.0	5.0	3.5		0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium	ug/L	100	100	100	11		< 1	< 1	< 1	< 1	< 1	< 1
Cobalt	ug/L	NC	40	100	100		< 6	< 6	< 6	< 6	< 6	< 6
Fluoride	ug/L	4,000	NC	NC	NC		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	4.0	4.0	39		< 1	< 1	< 1	< 1	< 1	< 1
Lithium	ug/L	NC	170	350	440		< 10	< 10	< 10	< 10	< 10	< 10
Mercury	ug/L	2	2.0	2.0	0.20#		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Molybdenum	ug/L	NC	73	210	3,200		< 5	< 5	< 5	< 5	< 5	< 5
Radium-226	pCi/L	NC	NC	NC	NC		0.182	< 0.148	< 0.199	< 0.312	< 0.152	< 0.165
Radium-228	pCi/L	NC	NC	NC	NC		< 0.556	< 0.478	< 0.577	< 1.10	< 0.519	< 0.605
Radium-226/228	pCi/L	5	NC	NC	NC		< 0.556	< 0.478	< 0.577	< 1.10	< 0.519	< 0.605
Selenium	ug/L	50	50	50	5.0		< 1	< 1	< 1	< 1	< 1	< 1
Thallium	ug/L	2	2.0	2.0	3.7		< 2	< 2	< 2	< 2	< 2	< 2

Notes:
ug/L - micrograms per liter; mg/L - milligrams per liter.
pCi/L - picocuries per liter; SU - standard units; pH is a field parameter.
MCL - Maximum Contaminant Level, EPA Drinking Water Standards and Health Advisories, April, 2012.
NC - no criteria.
* - Michigan Part 201 Generic Drinking Water Cleanup Criteria, December 21, 2020.
** - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April, 2012.
^ - Michigan Part 201 Groundwater Surface Water Interface (GSI) Criteria. Hardness-dependent criteria calculated using site-specific hardness of 180 mg CaCO3/L as measured at surface water sample SW-01 collected on April 9, 2018 from the Pigeon River. Chromium GSI criterion based on hexavalent chromium per footnote {H}.
# - If detected above 0.20 ug/L, further evaluation of low-level mercury may be necessary to evaluate the GSI pathway per Michigan Part 201 and MDEQ policy and procedure 09-014 dated June 20, 2012.
E - Criterion is the aesthetic drinking water value per footnote {E}.
EE - Criterion is based on the total dissolved solids GSI value per footnote {EE}.
(1) 40 CFR Part 257 Appendix III Detection Monitoring Constituents and Appendix IV Assessment Monitoring Constituents.
BOLD value indicates an exceedance of one or more of the listed criteria.
RED value indicates an exceedance of the MCL.
All metals were analyzed as total unless otherwise specified.

Table 4
Summary of Groundwater Sampling Results (Analytical)
JH Campbell Ponds 1-2N/1-2S – RCRA CCR Monitoring Program
West Olive, Michigan

						Sample Location:	JHC-MW-18004	JHC-MW-18005	JHC-MW-22001
						Sample Date:	4/12/2023	4/12/2023	4/12/2023
Constituent	Unit	EPA MCL	MI Residential*	MI Non-Residential*	MI GSI^				
Appendix III[(1)]									
Boron	ug/L	NC	500	500	7,200		239	237	284
Calcium	mg/L	NC	NC	NC	500[EE]		65.6	44.7	61.2
Chloride	mg/L	250**	250[E]	250[E]	500[EE]		6.26	7.25	8.12
Fluoride	ug/L	4,000	NC	NC	NC		< 1,000	< 1,000	< 1,000
Sulfate	mg/L	250**	250[E]	250[E]	500[EE]		52.3	51.6	44.5
Total Dissolved Solids	mg/L	500**	500[E]	500[E]	500		313	276	290
pH, Field	SU	**6.5 - 8.5****	**6.5 - 8.5[E]**	**6.5 - 8.5[E]**	6.5 - 9.0		7.4	8.5	8.2
Appendix IV[(1)]									
Antimony	ug/L	6	6.0	6.0	130		< 1	< 1	< 1
Arsenic	ug/L	10	10	10	10		< 1	7	5
Barium	ug/L	2,000	2,000	2,000	820		237	254	230
Beryllium	ug/L	4	4.0	4.0	18		< 1	< 1	< 1
Cadmium	ug/L	5	5.0	5.0	3.5		< 0.2	< 0.2	< 0.2
Chromium	ug/L	100	100	100	11		< 1	< 1	< 1
Cobalt	ug/L	NC	40	100	100		< 6	< 6	< 6
Fluoride	ug/L	4,000	NC	NC	NC		< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	4.0	4.0	39		< 1	< 1	< 1
Lithium	ug/L	NC	170	350	440		< 10	< 10	< 10
Mercury	ug/L	2	2.0	2.0	0.20#		< 0.2	< 0.2	< 0.2
Molybdenum	ug/L	NC	73	210	3,200		6	12	7
Radium-226	pCi/L	NC	NC	NC	NC		0.158	0.237	< 0.204
Radium-228	pCi/L	NC	NC	NC	NC		< 0.623	< 0.515	< 0.605
Radium-226/228	pCi/L	5	NC	NC	NC		< 0.623	0.583	< 0.605
Selenium	ug/L	50	50	50	**5.0**		**32**	**46**	**38**
Thallium	ug/L	2	2.0	2.0	3.7		< 2	< 2	< 2

Notes:
ug/L - micrograms per liter; mg/L - milligrams per liter.
pCi/L - picocuries per liter; SU - standard units; pH is a field parameter.
MCL - Maximum Contaminant Level, EPA Drinking Water Standards and Health Advisories, April, 2012.
NC - no criteria.
* - Michigan Part 201 Generic Drinking Water Cleanup Criteria, December 21, 2020.
** - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April, 2012.
^ - Michigan Part 201 Groundwater Surface Water Interface (GSI) Criteria. Hardness-dependent criteria calculated using site-specific hardness of 180 mg CaCO3/L as measured at surface water sample SW-01 collected on April 9, 2018 from the Pigeon River. Chromium GSI criterion based on hexavalent chromium per footnote {H}.
# - If detected above 0.20 ug/L, further evaluation of low-level mercury may be necessary to evaluate the GSI pathway per Michigan Part 201 and MDEQ policy and procedure 09-014 dated June 20, 2012.
[E] - Criterion is the aesthetic drinking water value per footnote {E}.
[EE] - Criterion is based on the total dissolved solids GSI value per footnote {EE}.
(1) 40 CFR Part 257 Appendix III Detection Monitoring Constituents and Appendix IV Assessment Monitoring Constituents.
BOLD value indicates an exceedance of one or more of the listed criteria.
RED value indicates an exceedance of the MCL.
All metals were analyzed as total unless otherwise specified.

Table 5

Summary of Groundwater Protection Standard Exceedances – April 2023
JH Campbell Ponds 1-2N/1-2S – RCRA CCR Monitoring Program
West Olive, Michigan

Constituent	Units	GWPS	JHC-MW-18005	
			LCL	UCL
Selenium	ug/L	50	23	100

Notes:

ug/L - micrograms per Liter.

-- - Not Applicable; well/parameter pair did not directly exceed the GWPS and was not included in further analysis.

GWPS - Groundwater Protection Standard as established in TRC's Technical Memorandum dated October 15, 2018.

UCL - Upper Confidence Limit (α = 0.01) of the downgradient data set.

LCL - Lower Confidence Limit (α = 0.01) of the downgradient data set.

Indicates a statistically significant exceedance of the GWPS.
An exceedance occurs when the LCL is greater than the GWPS.

Table 6
Summary of Groundwater Sampling Results (Analytical)
JH Campbell Nature and Extent Wells – RCRA CCR Monitoring Program
West Olive, Michigan

					Sample Location:	**JHC-MW-15002[(2)]**	**JHC-MW-15003[(2)]**	**JHC-MW-15005[(2)]**	**MW-14S**	**PZ-23S**	**PZ-24**
					Sample Date:	4/12/2023	4/12/2023	4/12/2023	4/13/2023	4/13/2023	4/11/2023
Constituent	Unit	EPA MCL	MI Residential*	MI Non-Residential*	MI GSI^						
Appendix III[(1)]											
Boron	ug/L	NC	**500**	**500**	7,200	**1,800**	**3,810**	325	< 20	< 20	144
Calcium	mg/L	NC	NC	NC	500[EE]	151	101	80.7	2.15	3.56	41.7
Chloride	mg/L	250**	250[E]	250[E]	500[EE]	90.7	17.0	1.20	1.26	< 1.00	2.40
Fluoride	ug/L	4,000	NC	NC	NC	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	250**	250[E]	250[E]	500[EE]	248	182	60.0	7.01	2.01	108
Total Dissolved Solids	mg/L	**500****	**500[E]**	**500[E]**	**500**	**780**	**573**	372	36	25	244
pH, Field	SU	**6.5 - 8.5****	**6.5 - 8.5[E]**	**6.5 - 8.5[E]**	**6.5 - 9.0**	6.7	7.3	7.1	**5.6**	6.9	6.8
Appendix IV[(1)]											
Antimony	ug/L	**6**	**6.0**	**6.0**	130	**15**	2	5	< 1	< 1	< 1
Arsenic	ug/L	**10**	**10**	**10**	**10**	**28**	8	2	< 1	< 1	< 1
Barium	ug/L	2,000	2,000	2,000	**820**	91	132	140	11	< 5	32
Beryllium	ug/L	4	4.0	4.0	18	< 1	< 1	< 1	< 1	< 1	< 1
Cadmium	ug/L	5	5.0	5.0	3.5	< 0.3	< 0.3	< 0.2	< 0.2	< 0.2	< 0.2
Chromium	ug/L	100	100	100	11	< 1	4	1	< 1	< 1	< 1
Cobalt	ug/L	NC	40	100	100	< 6	13	< 6	< 6	< 6	< 6
Fluoride	ug/L	4,000	NC	NC	NC	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	4.0	4.0	39	< 1	< 1	< 1	< 1	< 1	< 1
Lithium	ug/L	NC	170	350	440	13	< 10	20	< 10	< 10	< 10
Mercury	ug/L	2	2.0	2.0	0.20#	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Molybdenum	ug/L	NC	**73**	**210**	3,200	**656**	**254**	**83**	< 5	< 5	8
Radium-226	pCi/L	NC	NC	NC	NC	< 0.186	0.414	0.316	< 0.167	< 0.164	< 0.180
Radium-228	pCi/L	NC	NC	NC	NC	< 0.714	< 0.543	< 0.511	0.847	< 0.568	< 0.640
Radium-226/228	pCi/L	5	NC	NC	NC	0.818	< 0.543	< 0.511	0.840	< 0.568	< 0.640
Selenium	ug/L	**50**	**50**	**50**	**5.0**	**796**	**86**	**266**	< 1	< 1	< 1
Thallium	ug/L	2	2.0	2.0	3.7	< 2	< 2	< 2	< 2	< 2	< 2

Notes:

ug/L - micrograms per liter; mg/L - milligrams per liter.

pCi/L - picocuries per liter; SU - standard units; pH is a field parameter.

MCL - Maximum Contaminant Level, EPA Drinking Water Standards and Health Advisories, April, 2012.

NC - no criteria; -- - not analyzed.

* - Michigan Part 201 Generic Drinking Water Cleanup Criteria, December 21, 2020.

** - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April, 2012.

^ - Michigan Part 201 Groundwater Surface Water Interface (GSI) Criteria. Hardness-dependent criteria calculated using site-specific hardness of 180 mg CaCO3/L as measured at surface water sample SW-01 collected on April 9, 2018 from the Pigeon River. Chromium GSI criterion based on hexavalent chromium per footnote {H}.

- If detected above 0.20 ug/L, further evaluation of low-level mercury may be necessary to evaluate the GSI pathway per Michigan Part 201 and MDEQ policy and procedure 09-014 dated June 20, 2012.

[E] - Criterion is the aesthetic drinking water value per footnote {E}.

[EE] - Criterion is based on the total dissolved solids GSI value per footnote {EE}.

(1) 40 CFR Part 257 Appendix III Detection Monitoring Constituents and Appendix IV Assessment Monitoring Constituents.

(2) Included as nature and extent monitoring well to represent groundwater quality along the east edge of Ponds 1-2 that is influenced by the adjacent historical CCR management areas.

BOLD value indicates an exceedance of one or more of the listed criteria.

RED value indicates an exceedance of the MCL.

All metals were analyzed as total unless otherwise specified.

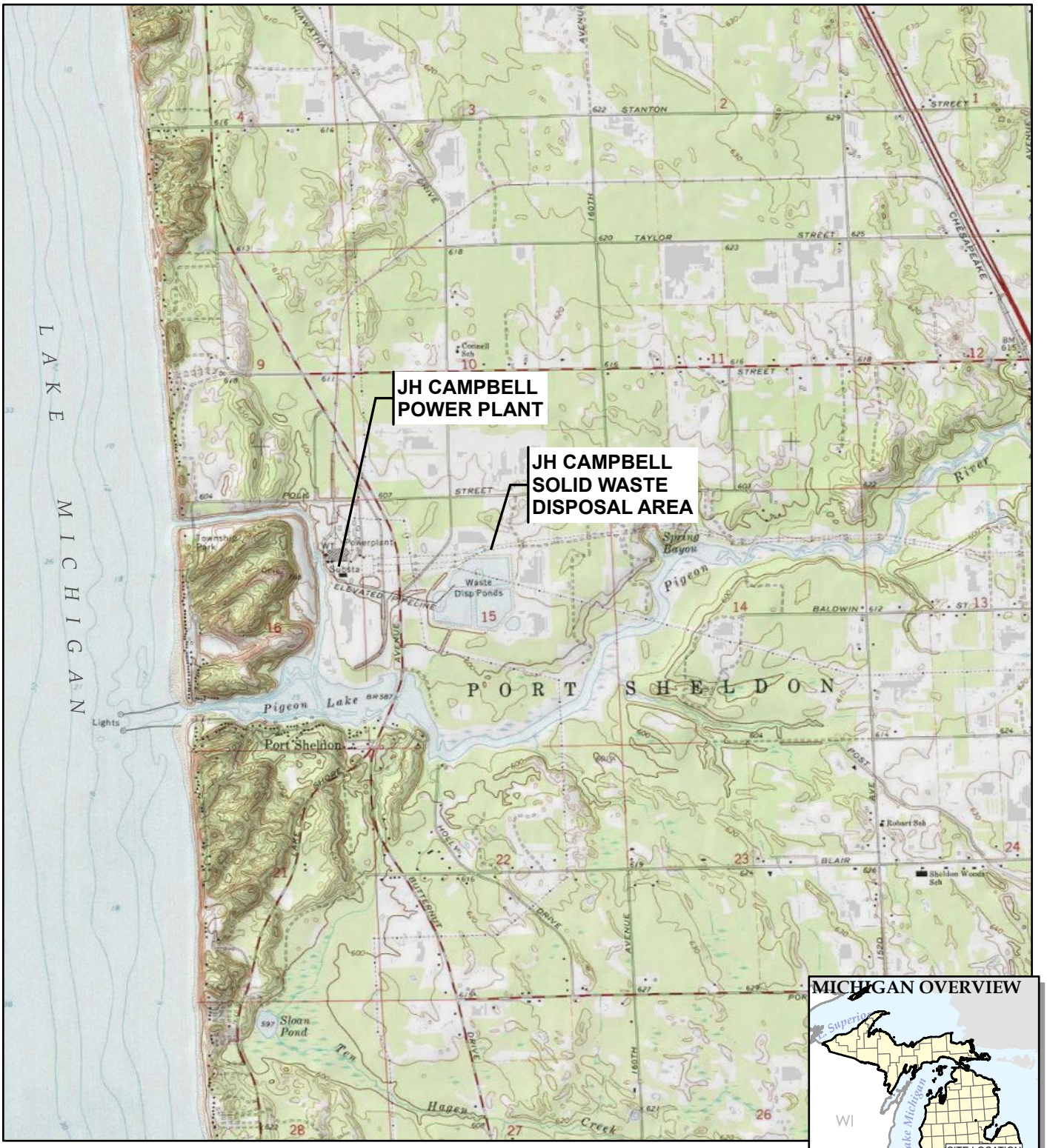
Table 6
Summary of Groundwater Sampling Results (Analytical)
JH Campbell Nature and Extent Wells – RCRA CCR Monitoring Program
West Olive, Michigan

					Sample Location:	**PZ-24S**	**PZ-40**	**PZ-40S**	**MW-22-14**	**MW-22-15**
					Sample Date:	4/13/2023	4/11/2023	4/13/2023	1/24/2023	1/24/2023
Constituent	Unit	EPA MCL	MI Residential*	MI Non-Residential*	MI GSI^					
Appendix III[(1)]										
Boron	ug/L	NC	**500**	**500**	7,200	< 20	215	23	225	238
Calcium	mg/L	NC	NC	NC	500[EE]	2.11	11.8	1.81	--	--
Chloride	mg/L	250**	250[E]	250[E]	500[EE]	1.20	5.38	< 1.00	--	--
Fluoride	ug/L	4,000	NC	NC	NC	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	250**	250[E]	250[E]	500[EE]	7.72	13.0	6.30	--	--
Total Dissolved Solids	mg/L	**500****	**500[E]**	**500[E]**	**500**	34	81	45	--	--
pH, Field	SU	**6.5 - 8.5****	**6.5 - 8.5[E]**	**6.5 - 8.5[E]**	**6.5 - 9.0**	**5.3**	6.6	**5.1**	8.4	**8.6**
Appendix IV[(1)]										
Antimony	ug/L	**6**	**6.0**	**6.0**	130	< 1	< 1	< 1	< 1	< 1
Arsenic	ug/L	**10**	**10**	**10**	**10**	< 1	< 1	< 1	1	1
Barium	ug/L	2,000	2,000	2,000	**820**	48	15	24	546	**996**
Beryllium	ug/L	4	4.0	4.0	18	< 1	< 1	< 1	< 1	< 1
Cadmium	ug/L	5	5.0	5.0	3.5	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium	ug/L	100	100	100	11	< 1	< 1	2	< 1	< 1
Cobalt	ug/L	NC	40	100	100	< 6	< 6	< 6	< 6	< 6
Fluoride	ug/L	4,000	NC	NC	NC	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	4.0	4.0	39	< 1	< 1	< 1	< 1	< 1
Lithium	ug/L	NC	170	350	440	< 10	< 10	< 10	11	< 10
Mercury	ug/L	2	2.0	2.0	0.20#	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Molybdenum	ug/L	NC	**73**	**210**	3,200	< 5	24	< 5	< 5	7
Radium-226	pCi/L	NC	NC	NC	NC	0.143	< 0.123	< 0.111	--	--
Radium-228	pCi/L	NC	NC	NC	NC	< 0.490	< 0.479	0.571	--	--
Radium-226/228	pCi/L	5	NC	NC	NC	< 0.490	< 0.479	0.619	--	--
Selenium	ug/L	**50**	**50**	**50**	**5.0**	< 1	< 1	< 1	**29**	**49**
Thallium	ug/L	2	2.0	2.0	3.7	< 2	< 2	< 2	< 2	< 2

Notes:

ug/L - micrograms per liter; mg/L - milligrams per liter.
pCi/L - picocuries per liter; SU - standard units; pH is a field parameter.
MCL - Maximum Contaminant Level, EPA Drinking Water Standards and Health Advisories, April, 2012.
NC - no criteria; -- - not analyzed.
* - Michigan Part 201 Generic Drinking Water Cleanup Criteria, December 21, 2020.
** - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April, 2012.
^ - Michigan Part 201 Groundwater Surface Water Interface (GSI) Criteria. Hardness-dependent criteria calculated using site-specific hardness of 180 mg CaCO3/L as measured at surface water sample SW-01 collected on April 9, 2018 from the Pigeon River. Chromium GSI criterion based on hexavalent chromium per footnote {H}.
# - If detected above 0.20 ug/L, further evaluation of low-level mercury may be necessary to evaluate the GSI pathway per Michigan Part 201 and MDEQ policy and procedure 09-014 dated June 20, 2012.
[E] - Criterion is the aesthetic drinking water value per footnote {E}.
[EE] - Criterion is based on the total dissolved solids GSI value per footnote {EE}.
(1) 40 CFR Part 257 Appendix III Detection Monitoring Constituents and Appendix IV Assessment Monitoring Constituents.
(2) Included as nature and extent monitoring well to represent groundwater quality along the east edge of Ponds 1-2 that is influenced by the adjacent historical CCR management areas.
BOLD value indicates an exceedance of one or more of the listed criteria.
RED value indicates an exceedance of the MCL.
All metals were analyzed as total unless otherwise specified.

Figures



BASE MAP FROM USGS 7.5 MINUTE TOPOGRAPHIC QUADRANGLE SERIES.

N

1:36,000
1:36,000

0 3,000 6,000 FEET

TRC

999 Fourier Drive
Suite 101
Madison, WI 53717
Phone: 608.826.3663

TRC - GIS

PROJECT:

CONSUMERS ENERGY COMPANY
JH CAMPBELL POWER PLANT
WEST OLIVE, MICHIGAN

TITLE:

SITE LOCATION MAP

DRAWN BY:	A. FOJTIK
CHECKED BY:	H. SCHNAIDT
APPROVED BY:	S. HOLMSTROM
DATE:	JULY 2023
PROJ. NO.:	514398.0000
FILE:	T:\1-PROJECTS\Consumers_Energy\464090_JHC\2-APRX\464090_JHC.aprx

FIGURE 1

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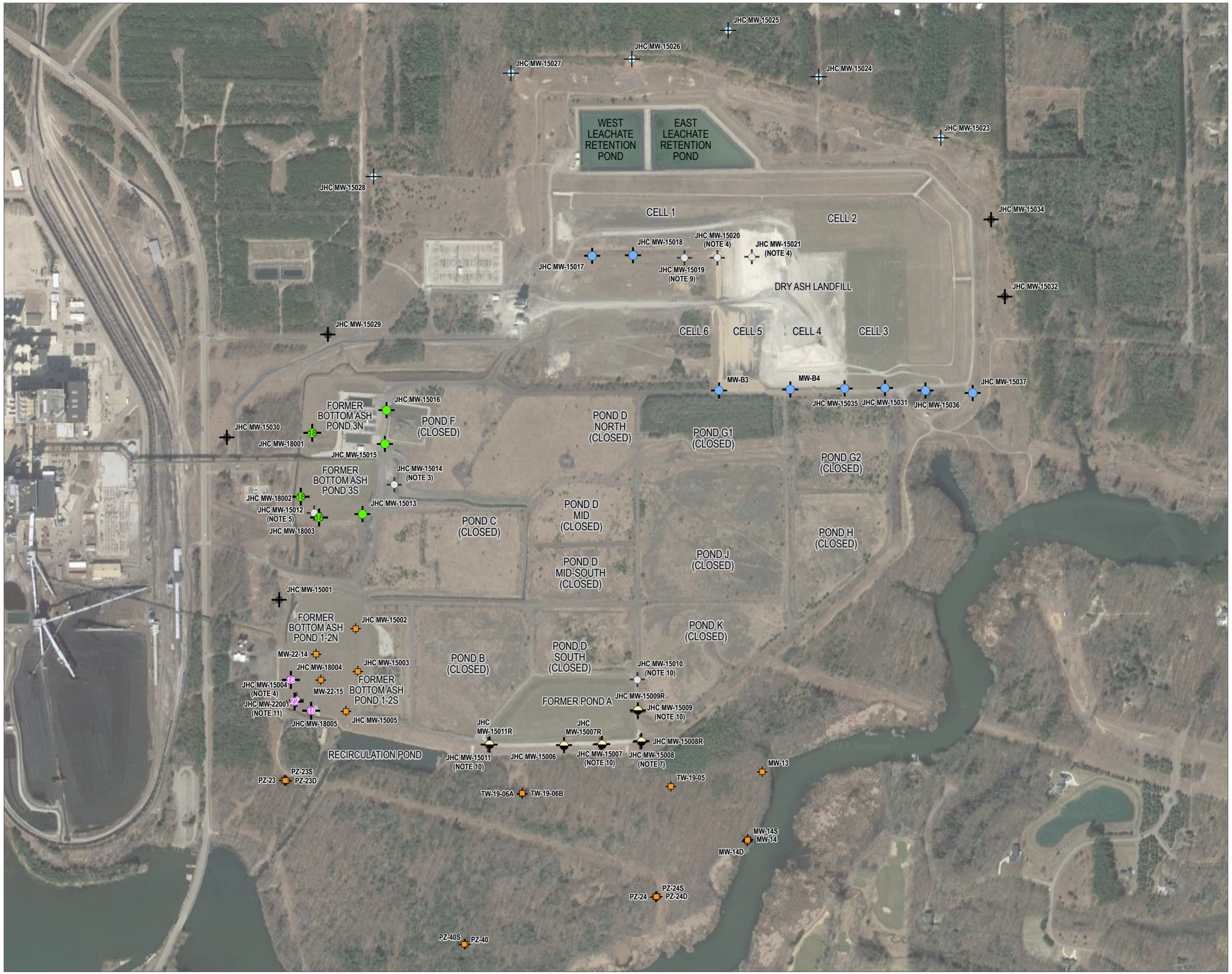

LEGEND

- 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

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.

N

1:8,400
1" = 700'
0 500 1,000 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
CHECKED BY: H. SCHNAIDT	FIGURE 2
APPROVED BY: S. HOLMSTROM	
DATE: JULY 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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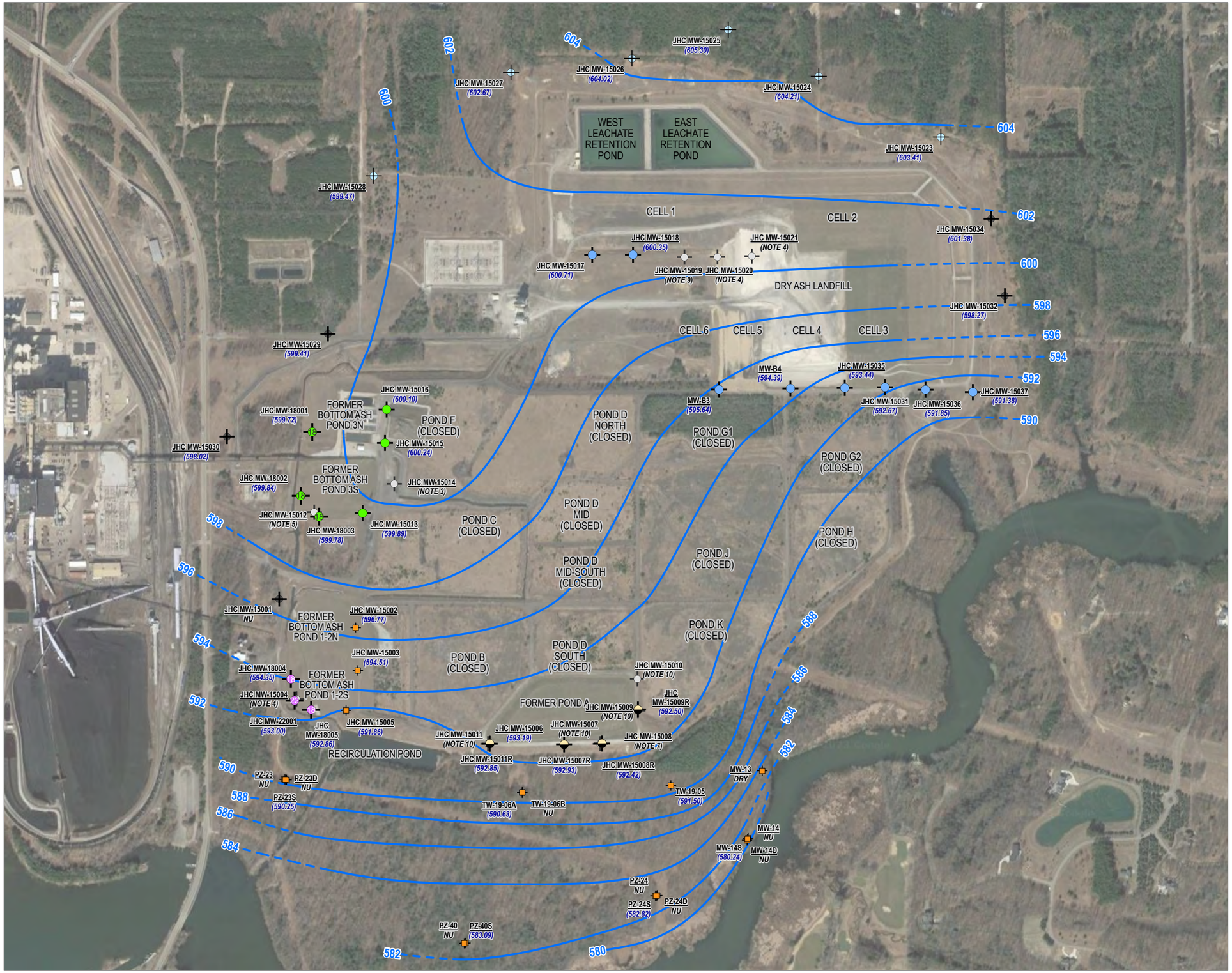

LEGEND

- 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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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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Appendix A
Data Quality Reviews

Laboratory Data Quality Review
Groundwater Monitoring Event April 2023
CEC JH Campbell Background Wells

Groundwater samples were collected by Consumers Energy (CE) Laboratory Services for the April 2023 sampling event. Samples were analyzed for total metals, anions, alkalinity, and total dissolved solids (TDS) by CE Laboratory Services in Jackson, Michigan. The laboratory analytical results were reported in laboratory sample delivery group (SDG) 23-0320.

During the April 2023 sampling event, a groundwater sample was collected from each of the following wells:

- JHC-MW-15023
- JHC-MW-15024
- JHC-MW-15025
- JHC-MW-15026
- JHC-MW-15027
- JHC-MW-15028

Each sample was analyzed for the following constituents:

Analyte Group	Method
Anions (Fluoride, Chloride, Sulfate)	EPA 300.0
Total Dissolved Solids (TDS)	SM 2540C
Total Metals	SW-846 6020B/7470A
Alkalinity	SM 2320B

TRC reviewed the laboratory data to assess data usability. The following sections summarize the data review procedure and the results of the review.

Data Usability Review Procedure

The analytical data were reviewed using the USEPA National Functional Guidelines for Inorganic Superfund Methods Data Review (USEPA, 2020). The following items were included in the evaluation of the data:

- Sample receipt, as noted in the cover page or case narrative;
- Technical holding times for analyses;
- Reporting limits (RLs) compared to project-required RLs;
- Data for method blanks, equipment blanks, and field blanks. Method blanks are used to assess potential contamination arising from laboratory sample preparation and/or analytical procedures. Field and equipment blanks are used to assess potential contamination arising from field procedures;
- Data for laboratory control samples (LCSs) and laboratory control sample duplicates (LCSDs), when performed. The LCSs and/or LCSDs are used to assess the accuracy of the analytical method using a clean matrix;

- Percent recoveries for matrix spike (MS) and matrix spike duplicates (MSD), when performed on project samples. Percent recoveries are calculated for each analyte spiked and used to assess bias due to sample matrix effects;
- Data for laboratory duplicates, when performed on project samples. The laboratory duplicates are replicate analyses of one sample and are used to assess the precision of the analytical method;
- Data for blind field duplicates. Field duplicate samples are used to assess variability introduced by the sampling and analytical processes; and
- Overall usability of the data.

It should be noted that results for method blanks and LCSs were not provided for review by CE Laboratory Services. Therefore, potential contamination arising from laboratory sample preparation and/or analytical procedures and the accuracy of the analytical method using a clean matrix could not be evaluated for the total metals, anions, alkalinity, and TDS analyses.

This data usability report addresses the following items:

- Usability of the data if quality control (QC) results suggest potential problems with all or some of the data;
- Actions regarding specific QC criteria exceedances.

Review Summary

The data quality objectives and laboratory completeness goals for the project were met, and the data are usable for their intended purpose. A summary of the data quality review, including non-conformances and issues identified in this evaluation are noted below.

- The reviewed Appendix III and IV constituents as well as alkalinity, magnesium, potassium, and sodium will be utilized for the purposes of an assessment monitoring program.
- Data are usable for the purposes of the assessment monitoring program.
- When the data are evaluated through an assessment monitoring statistical program, findings below may be used to support the removal of outliers.

QA/QC Sample Summary

- One equipment blank (EB-01) and one field blank (FB-01) were collected. Target analytes were not detected in these blank samples.
- MS and MSD analyses were performed on sample JHC-MW-15025 for total metals and anions. The recoveries were within the acceptance limits. Relative percent differences (RPDs) were not provided by the laboratory and therefore were not evaluated; further, MS/MSD concentrations were not provided by the laboratory. However, since all recoveries were within the acceptance limits, there is no impact on data usability due to this issue.
- The field duplicate pair samples were DUP-01/JHC-MW-15027 for total metals, anions, alkalinity, and TDS. All criteria were met.

Laboratory Data Quality Review
Groundwater Monitoring Event April 2023
CEC JH Campbell Background Wells

Groundwater samples were collected by Consumers Energy (CE) Laboratory Services for the April 2023 sampling event. Samples were analyzed for radium by Eurofins in St. Louis, Missouri (Eurofins - St. Louis). The laboratory analytical results were reported in laboratory sample delivery group (SDG) 160-49762-1.

During the April 2023 sampling event, a groundwater sample was collected from each of the following wells:

- JHC-MW-15023
- JHC-MW-15024
- JHC-MW-15025
- JHC-MW-15026
- JHC-MW-15027
- JHC-MW-15028

Each sample was analyzed for the following constituents:

Analyte Group	Method
Radium (Ra-226, Ra-228, Combined Ra-226 & Ra-228)	EPA 903.0, EPA 904.0

TRC reviewed the laboratory data to assess data usability. The following sections summarize the data review procedure and the results of the review.

Data Usability Review Procedure

The analytical data were reviewed using the Department of Energy Evaluation of Radiochemical Data Usability (USDOE, 1997). The following items were included in the evaluation of the data:

- Sample receipt, as noted in the cover page or case narrative;
- Technical holding times for analyses;
- Reporting limits (RLs) compared to project-required RLs;
- Data for method blanks, equipment blanks, and field blanks. Method blanks are used to assess potential contamination arising from laboratory sample preparation and/or analytical procedures. Field and equipment blanks are used to assess potential contamination arising from field procedures;
- Data for laboratory control samples (LCSs) and laboratory control sample duplicates (LCSDs), when performed. The LCSs and/or LCSDs are used to assess the accuracy of the analytical method using a clean matrix;
- Percent recoveries for matrix spike (MS) and matrix spike duplicates (MSD), when performed on project samples. Percent recoveries are calculated for each analyte spiked and used to assess bias due to sample matrix effects;
- Percent recoveries for carriers, where applicable, for radiochemistry only. Carriers are used to assess the chemical yield for the preparation and/or instrument efficiency;

- Data for laboratory duplicates, when performed on project samples. The laboratory duplicates are replicate analyses of one sample and are used to assess the precision of the analytical method;
- Data for blind field duplicates. Field duplicate samples are used to assess variability introduced by the sampling and analytical processes; and
- Overall usability of the data.

This data usability report addresses the following items:

- Usability of the data if quality control (QC) results suggest potential problems with all or some of the data;
- Actions regarding specific QC criteria exceedances.

Review Summary

The data quality objectives and laboratory completeness goals for the project were met, and the data are usable for their intended purpose. A summary of the data quality review, including non-conformances and issues identified in this evaluation are noted below.

- The reviewed constituents will be utilized for the purposes of an assessment monitoring program.
- Data are usable for the purposes of the assessment monitoring program.
- When the data are evaluated through an assessment monitoring statistical program, findings below may be used to support the removal of outliers.

QA/QC Sample Summary

- Target analytes were not detected in the method blanks (MBs) with the following exception.
  - Radium-228 was detected in MB 160-610088/1-A at 0.5308 +/- 0.333 pCi/L; however, radium-228 was not detected in the associated samples, thus no data are affected.
- One equipment blank (EB-01) and one field blank (FB-01) were collected. Target analytes were not detected in these blank samples.
- LCS/LCSD recoveries and relative percent differences for all target analytes were within laboratory control limits.
- MS/MSD and laboratory duplicate analyses were not performed on a sample from this SDG.
- The field duplicate pair samples were DUP-01/JHC-MW-15027. All criteria were met.
- Carrier recoveries were within 40-110%.

Laboratory Data Quality Review
Groundwater Monitoring Event April 2023
Consumers Energy JH Campbell Ponds 1 and 2

Groundwater samples were collected by Consumers Energy (CE) Laboratory Services for the April 2023 sampling event. Samples were analyzed for total metals, anions, and total dissolved solids by CE Laboratory Services in Jackson, Michigan. The laboratory analytical results were reported in sample delivery group (SDG) 23-0321.

During the April 2023 sampling event, a groundwater sample was collected from each of the following wells:

- JHC-MW-15002
- JHC-MW-15003
- JHC-MW-15005
- JHC-MW-18004
- JHC-MW-18005
- JHC-MW-22001

Each sample was analyzed for the following constituents:

Analyte Group	Method
Anions (Fluoride, Chloride, Sulfate)	EPA 300.0
Total Dissolved Solids (TDS)	SM 2540C
Total Metals	SW-846 6020B/7470A

TRC reviewed the laboratory data to assess data usability. The following sections summarize the data review procedure and the results of the review.

Data Usability Review Procedure

The analytical data were reviewed using the USEPA National Functional Guidelines for Inorganic Superfund Methods Data Review (USEPA, 2020). The following items were included in the evaluation of the data:

- Sample receipt; as noted in the cover page or case narrative;
- Technical holding times for analyses;
- Reporting limits (RLs) compared to project-required RLs;
- Data for method blanks, equipment blanks, and field blanks. Method blanks are used to assess potential contamination arising from laboratory sample preparation and/or analytical procedures. Field and equipment blanks are used to assess potential contamination arising from field procedures;
- Data for laboratory control samples (LCSs) and laboratory control sample duplicates (LCSDs), when performed. The LCSs and/or LCSDs are used to assess the accuracy of the analytical method using a clean matrix;

- Percent recoveries for matrix spike (MS) and matrix spike duplicates (MSD), when performed on project samples. Percent recoveries are calculated for each analyte spiked and used to assess bias due to sample matrix effects;
- Data for laboratory duplicates, when performed on project samples. The laboratory duplicates are replicate analyses of one sample and are used to assess the precision of the analytical method;
- Data for blind field duplicates. Field duplicate samples are used to assess variability introduced by the sampling and analytical processes; and
- Overall usability of the data.

It should be noted that results for method blanks and LCSs were not provided for review by CE Laboratory Services. Therefore, potential contamination arising from laboratory sample preparation and/or analytical procedures and the accuracy of the analytical method using a clean matrix could not be evaluated for total metals, anions, and TDS analyses.

This data usability report addresses the following items:

- Usability of the data if quality control (QC) results suggest potential problems with all or some of the data;
- Actions regarding specific QC criteria exceedances.

Review Summary

The data quality objectives and laboratory completeness goals for the project were met, and the data are usable for their intended purpose. A summary of the data quality review, including non-conformances and issues identified in this evaluation, are noted below.

- The reviewed Appendix III and IV constituents will be utilized for the purposes of an assessment monitoring program.
- Data are usable for the purposes of the assessment monitoring program.
- When the data are evaluated through an assessment monitoring statistical program, findings below may be used to support the removal of outliers.

QA/QC Sample Summary

- One equipment blank (EB-02) and one field blank (FB-02) were collected. Target analytes were not detected in these blank samples.
- MS and MSD analyses were performed on sample JHC-MW-18004 for total metals and anions. The recoveries were within the acceptance limits. Relative percent differences (RPDs) were not provided by the laboratory and therefore were not evaluated; further, MS/MSD concentrations were not provided by the laboratory. However, since all recoveries were within the acceptance limits, there is no impact on data usability due to this issue.
- The field duplicate pair samples were DUP-02/JHC-MW-15003 for total metals, anions, and TDS. All criteria were met.
- The RL for cadmium was above the requested RL (0.2 mg/L) in samples JHC-MW-15002 (0.3 mg/L), JHC-MW-15003 (0.3 mg/L), and DUP-02 (0.4 mg/L) due to matrix interference.

Laboratory Data Quality Review
Groundwater Monitoring Event April 2023
Consumers Energy JH Campbell Ponds 1 and 2

Groundwater samples were collected by Consumers Energy (CE) Laboratory Services for the April 2023 sampling event. Samples were analyzed for radium by Eurofins in St. Louis, Missouri (Eurofins - St. Louis). The laboratory analytical results were reported in sample delivery group (SDG) 160-49752-1.

During the May 2023 sampling event, a groundwater sample was collected from each of the following wells:

- JHC-MW-15002
- JHC-MW-15003
- JHC-MW-15005
- JHC-MW-18004
- JHC-MW-18005
- JHC-MW-22001

Each sample was analyzed for the following constituents:

Analyte Group	Method
Radium (Ra-226, Ra-228, Combined Ra-226 & Ra-228)	EPA 903.0, EPA 904.0

TRC reviewed the laboratory data to assess data usability. The following sections summarize the data review procedure and the results of the review.

Data Usability Review Procedure

The analytical data were reviewed using the Department of Energy Evaluation of Radiochemical Data Usability (USDOE, 1997). The following items were included in the evaluation of the data:

- Sample receipt, as noted in the cover page or case narrative
- Technical holding times for analyses;
- Reporting limits (RLs) compared to project-required RLs;
- Data for method blanks, equipment blanks, and field blanks, where applicable. Method blanks are used to assess potential contamination arising from laboratory sample preparation and/or analytical procedures. Field and equipment blanks are used to assess potential contamination arising from field procedures;
- Data for laboratory control samples (LCSs) and laboratory control sample duplicates (LCSDs), when performed. The LCSs and/or LCSDs are used to assess the accuracy of the analytical method using a clean matrix;
- Percent recoveries for matrix spike (MS) and matrix spike duplicates (MSD), when performed on project samples. Percent recoveries are calculated for each analyte spiked and used to assess bias due to sample matrix effects;
- Percent recoveries for carriers, where applicable, for radiochemistry only. Carriers are used

to assess the chemical yield for the preparation and/or instrument efficiency;

- Data for laboratory duplicates, when performed on project samples. The laboratory duplicates are replicate analyses of one sample and are used to assess the precision of the analytical method;
- Data for blind field duplicates. Field duplicate samples are used to assess variability introduced by the sampling and analytical processes; and
- Overall usability of the data.

This data usability report addresses the following items:

- Usability of the data if quality control (QC) results suggest potential problems with all or some of the data;
- Actions regarding specific QC criteria exceedances.

Review Summary

The data quality objectives and laboratory completeness goals for the project were met, and the data are usable for their intended purpose. A summary of the data quality review, including non-conformances and issues identified in this evaluation, are noted below.

- The reviewed constituents will be utilized for the purposes of an assessment monitoring program.
- Data are usable for the purposes of the assessment monitoring program.
- When the data are evaluated through an assessment monitoring statistical program, findings below may be used to support the removal of outliers.

QA/QC Sample Summary

- Target analytes were not detected in the method blanks.
- One equipment blank (EB-02) and one field blank (FB-02) were collected. Target analytes were not detected in these blank samples.
- LCS/LCSD recoveries and relative percent differences (RPDs) for all target analytes were within laboratory control limits.
- MS/MSD and laboratory duplicate analyses were not performed on a sample from this SDG.
- The field duplicate pair samples were DUP-02/JHC-MW-15003. All criteria were met.
- Carrier recoveries were within 40-110%.

Laboratory Data Quality Review
Groundwater Monitoring Event January 2023
Consumers Energy JH Campbell Ponds 1 and 2

Groundwater samples were collected by Consumers Energy (CE) Laboratory Services for the January 2023 sampling event. Samples were analyzed for total metal and, anions by CE Laboratory Services in Jackson, Michigan. The laboratory analytical results were reported in sample delivery group (SDG) 23-0059.

During the January 2023 sampling event, a groundwater sample was collected from each of the following wells:

- MW-22-14
- MW-22-15

Each sample was analyzed for the following constituents:

Analyte Group	Method
Anions (Fluoride, Chloride, Sulfate)	EPA 300.0
Total Metals	SW-846 6020B/7470A

TRC reviewed the laboratory data to assess data usability. The following sections summarize the data review procedure and the results of the review.

Data Usability Review Procedure

The analytical data were reviewed using the USEPA National Functional Guidelines for Inorganic Superfund Methods Data Review (USEPA, 2020). The following items were included in the evaluation of the data:

- Sample receipt; as noted in the cover page or case narrative;
- Technical holding times for analyses;
- Reporting limits (RLs) compared to project-required RLs;
- Data for method blanks, equipment blanks, and field blanks. Method blanks are used to assess potential contamination arising from laboratory sample preparation and/or analytical procedures. Field and equipment blanks are used to assess potential contamination arising from field procedures;
- Data for laboratory control samples (LCSs) and laboratory control sample duplicates (LCSDs), when performed. The LCSs and/or LCSDs are used to assess the accuracy of the analytical method using a clean matrix;
- Percent recoveries for matrix spike (MS) and matrix spike duplicates (MSD), when performed on project samples. Percent recoveries are calculated for each analyte spiked and used to assess bias due to sample matrix effects;

- Data for laboratory duplicates, when performed on project samples. The laboratory duplicates are replicate analyses of one sample and are used to assess the precision of the analytical method;
- Data for blind field duplicates. Field duplicate samples are used to assess variability introduced by the sampling and analytical processes; and
- Overall usability of the data.

It should be noted that results for method blanks and LCSs were not provided for review by CE Laboratory Services. Therefore, potential contamination arising from laboratory sample preparation and/or analytical procedures and the accuracy of the analytical method using a clean matrix could not be evaluated for total metals and anions analyses.

This data usability report addresses the following items:

- Usability of the data if quality control (QC) results suggest potential problems with all or some of the data;
- Actions regarding specific QC criteria exceedances.

Review Summary

The data quality objectives and laboratory completeness goals for the project were met, and the data are usable for their intended purpose. A summary of the data quality review, including non-conformances and issues identified in this evaluation, are noted below.

- The reviewed Appendix III and IV constituents will be utilized for the purposes of an assessment monitoring program.
- Data are usable for the purposes of the assessment monitoring program.
- When the data are evaluated through an assessment monitoring statistical program, findings below may be used to support the removal of outliers.

QA/QC Sample Summary:

-
- No duplicate or MS/MSD samples were collected, and no laboratory QC data was provided.
- The laboratory met technical holding times for all samples.
- Samples were properly preserved.

Appendix B
April 2023 Assessment Monitoring Statistical Evaluation

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Technical Memorandum

Date:	July 20, 2023
To:	Bethany Swanberg, Consumers Energy
From:	Sarah Holmstrom, TRC Kristin Lowery, TRC Henry Schnaidt, TRC
Project No.:	514398.0000.0000 Phase 1 Task 2
Subject:	Statistical Evaluation of April 2023 Assessment Monitoring Sampling Event, JH Campbell Bottom Ash Ponds 1-2 North and 1-2 South CCR Unit, Consumers Energy Company, West Olive, Michigan

Consumers Energy is continuing semiannual assessment monitoring in accordance with §257.95 of the CCR Rule[1] at the JH Campbell Power Plant Bottom Ash Ponds 1-2 North and 1-2 South (Ponds 1-2). The first semiannual assessment monitoring event of 2023 was conducted on April 10 through 13, 2023. In accordance with §257.95, the assessment monitoring data must be compared to Groundwater Protection Standards (GWPSs) to determine whether or not Appendix IV constituents are detected at statistically significant levels above the GWPSs. 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. The results obtained and the Sanitas™ output files are included as an attachment.

The statistical evaluation of the first semiannual assessment monitoring event for 2023 indicates that there are no constituents present at statistically significant levels exceeding the GWPS in the downgradient monitoring well network at the Ponds 1-2 CCR Unit:

Constituent	GWPS	# Downgradient Wells Observed

No constituents are present at statistically significant levels above the GWPSs.

These results are consistent with the results of the previous assessment monitoring data statistical evaluation, with no new statistically significant levels above the GWPSs. Consumers Energy will continue executing the self-implementing groundwater compliance schedule in conformance with §257.90 - §257.98.

[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.

Assessment Monitoring Statistical Evaluation

The current downgradient monitoring well network at the Ponds 1-2 CCR Unit boundary is made up of three monitoring wells: Monitoring wells JHC-MW-18004 (west), JHC-MW-18005 (south), and JHC-MW-22001(south), as described in the January 27, 2023 Groundwater Monitoring System Certification.

In response to the influence of an alternate source at JHC-MW-15002, JHC-MW-15003, and JHC-MW-15005, a new monitoring well, JHC-MW-22001, was installed south of Ponds 1-2 in order to provide an additional downgradient well to assess groundwater quality downgradient from the former Ponds 1-2 footprint.

Following the semiannual assessment monitoring sampling event for 2022, Ponds 1-2 groundwater data from the certified monitoring network were evaluated in accordance with the Groundwater Statistical Evaluation Plan (Stats Plan) (TRC, October 2017). The assessment 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). To evaluate whether or not a GWPS exceedance is statistically significant, the difference in concentration observed at the downgradient compliance wells during a given assessment 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[2], the preferred method for comparisons to a fixed standard is confidence limits. An exceedance of the standard occurs when the 99 percent lower confidence level of the downgradient data exceeds the GWPS. Based on the number of historical observations in the representative sample population, the sample mean, the sample standard deviation, and a selected confidence level (i.e. 99 percent), an upper and lower confidence limit is calculated. The actual mean concentration of the population, with 99 percent confidence, will fall between the lower and upper confidence limits.

The concentrations observed in the downgradient wells are deemed to be a statistically significant exceedance when the 99 percent lower confidence limit of the downgradient data exceeds the GWPS. If the confidence interval straddles the GWPS (i.e. the lower confidence level is below the GWPS but the upper confidence level 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 measured concentration is a result of a release from the CCR unit versus the inherent variability of the sample data. This statistical approach is consistent with the statistical methods for assessment monitoring presented in §257.93(f) and (g). Statistical evaluation methodologies built into the CCR Rule, and numerous other federal rules, are key in determining whether or not individually measured data points represent a concentration increase over the baseline or a fixed standard (such as a GWPS in an assessment monitoring program).

For each detected Appendix IV constituent, the concentrations for each well were first compared directly to the GWPS, as shown on Table 1. Constituent-well combinations that included a direct exceedance of the GWPS within the past eight monitoring events (October 2019 through April 2023 for JHC-MW-18004 and JHC-MW-18005) were retained for further analysis (Attachment 1). Monitoring

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

well JHC-MW-22001 has not accumulated an adequate number of data points to perform the statistical analysis, however, direct comparison of the results to GWPS was still performed as shown on Table 1. Direct comparison GWPS exceedances included the following constituent-well combinations:

- Selenium in JHC-MW-18005.

Groundwater data for the constituent-well combinations with direct-comparison exceedances of a GWPS were then 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 each of the CCR Appendix IV parameters using a 99 percent confidence level, i.e., a significance level (α) of 0.01. The following narrative describes the methods employed and the results obtained. The Sanitas™ output files are included as an attachment.

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 cumulative dataset.

The results of these evaluations are presented and discussed below. The statistical evaluation was completed for monitoring wells JHC-MW-18004 and JHC-MW-18005. Monitoring well JHC-MW-22001 is in the process of acquiring an adequate number of data points to perform statistical evaluation; however, no GWPS exceedances have been observed at that location as shown in Table 1.

Initially, the results for these well-constituent pairs were observed visually for potential outliers and trends. No outliers were apparent. No statistically significant trends were found.

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.

The Sanitas™ software was then used to test compliance at the downgradient monitoring wells using the confidence interval method for the most recent eight sampling events. Eight independent sampling events provide the appropriate density of data as recommended per the Unified Guidance yet are collected recently enough to provide an indication of current condition. The 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. Non-detect data was handled in accordance with the Stats Plan for the purposes of calculating the confidence intervals.

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. Data distributions were as follows:

JHC-MW-18005

Distribution	Parameter-Well Combinations
Normal	Selenium at JHC-MW-18005

The confidence interval test compares the lower confidence limit to the GWPS. The statistical evaluation of the Appendix IV constituents shows no statistically significant levels above the GWPSs within the Ponds 1-2 monitoring network. Consumers Energy will continue executing the self-implementing groundwater compliance schedule in conformance with §257.90 - §257.98.

Attachments

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

Attachment 1 Sanitas™ Output

Table

Table 1

Comparison of Groundwater Sampling Results to Groundwater Protection Standards for Statistical Evaluation
JH Campbell Ponds 1-2N/1-2S – RCRA CCR Monitoring Program
West Olive, Michigan

		Sample Location:	JHC-MW-18004							
		Sample Date:	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								
Appendix III										
Boron	ug/L	NA	620	524	638	444	456	346	437	239
Calcium	mg/L	NA	73	117	98.4	88.9	73.1	76.5	75.3	65.6
Chloride	mg/L	NA	40	14.2	12.5	5.17	10.8	2.22	8.85	6.26
Fluoride	ug/L	NA	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	NA	120	249	127	64.4	69.3	100	66.0	52.3
Total Dissolved Solids	mg/L	NA	310	604	515	418	407	381	362	313
pH, Field	SU	NA	7.2	6.9	7.4	7.7	7.7	7.6	7.9	7.4
Appendix IV										
Antimony	ug/L	6	< 1.0	< 1	< 1	< 1	< 1	< 1	1	< 1
Arsenic	ug/L	10	1.1	< 1	1	< 1	1	< 1	< 1	< 1
Barium	ug/L	2,000	270	210	323	325	361	302	286	237
Beryllium	ug/L	4	< 1.0	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Cadmium	ug/L	5	< 0.20	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium	ug/L	100	1.3	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Cobalt	ug/L	15	< 6.0	< 15	< 15	< 6	< 6	< 6	< 6	< 6
Fluoride	ug/L	4,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	15	< 1.0	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Lithium	ug/L	40	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Mercury	ug/L	2	< 0.20	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Molybdenum	ug/L	100	10	7	10	7	7	< 5	< 5	6
Radium-226/228	pCi/L	5	0.851	0.952	0.821	0.885	0.745	0.582	1.15	< 0.623
Selenium	ug/L	**50**	33	34	18	39	34	27	44	32
Thallium	ug/L	2	< 2.0	< 2	< 2	< 2	< 2	< 2	< 2	< 2

Notes:

ug/L - micrograms per liter.
mg/L - milligrams per liter.
SU - standard units; pH is a field parameter.
pCi/L - picocuries per liter.
NA - not applicable.
-- - not analyzed.
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.

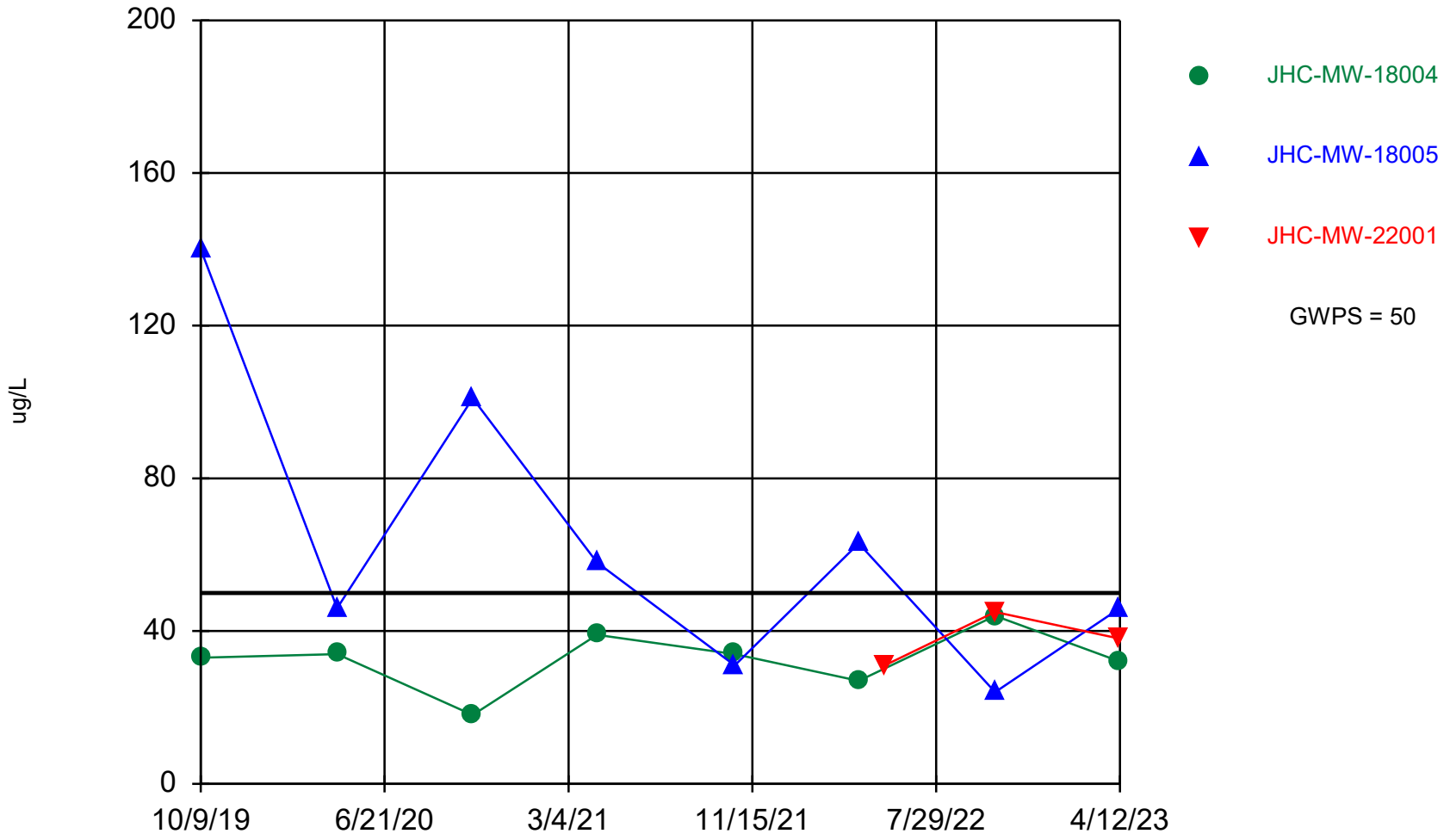
Table 1
Comparison of Groundwater Sampling Results to Groundwater Protection Standards for Statistical Evaluation
JH Campbell Ponds 1-2N/1-2S – RCRA CCR Monitoring Program
West Olive, Michigan

		Sample Location:	JHC-MW-18005											JHC-MW-22001			
		Sample Date:	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															
Appendix III						Field Dup				Field Dup		Field Dup			Field Dup		
Boron	ug/L	NA	660	534	486	499	382	408	347	343	340	326	237	365	376	353	284
Calcium	mg/L	NA	55	42.6	58.7	60.1	45.5	55.7	46.3	45.1	52.3	52.0	44.7	62.4	60.2	56.7	61.2
Chloride	mg/L	NA	18	19.6	16.4	16.8	16.6	8.25	7.55	6.78	8.41	8.90	7.25	5.79	5.60	8.05	8.12
Fluoride	ug/L	NA	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	NA	110	74.5	105	108	75.3	79.9	55.4	52.6	45.2	46.2	51.6	60.8	60.8	56.5	44.5
Total Dissolved Solids	mg/L	NA	330	262	339	317	287	337	263	282	299	341	276	311	309	350	290
pH, Field	SU	NA	8.8	8.5	8.4	--	8.7	8.4	8.6	--	8.5	--	8.5	8.1	--	8.2	8.2
Appendix IV																	
Antimony	ug/L	6	< 1.0	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Arsenic	ug/L	10	7.1	8	8	8	8	8	7	7	7	7	7	5	5	5	5
Barium	ug/L	2,000	150	144	207	206	201	310	258	256	316	324	254	216	217	248	230
Beryllium	ug/L	4	< 1.0	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Cadmium	ug/L	5	< 0.20	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium	ug/L	100	1.9	< 1	1	1	< 1	< 1	1	1	1	1	< 1	< 1	< 1	1	< 1
Cobalt	ug/L	15	< 6.0	< 15	< 15	< 15	< 6	< 6	< 6	< 6	< 6	< 6	< 6	< 6	< 6	< 6	< 6
Fluoride	ug/L	4,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	15	< 1.0	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Lithium	ug/L	40	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Mercury	ug/L	2	< 0.20	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Molybdenum	ug/L	100	66	9	7	7	7	< 5	6	7	9	9	12	8	8	7	7
Radium-226/228	pCi/L	5	0.953	< 0.455	< 0.205	0.185	< 0.395	0.507	0.507	0.765	0.881	1.17	0.583	< 0.532	< 0.465	< 0.514	< 0.605
Selenium	ug/L	**50**	**140**	46	**99**	**103**	**58**	31	**64**	**62**	24	25	46	32	30	45	38
Thallium	ug/L	2	< 2.0	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2

Notes:
ug/L - micrograms per liter.
mg/L - milligrams per liter.
SU - standard units; pH is a field parameter.
pCi/L - picocuries per liter.
NA - not applicable.
-- - not analyzed.
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

Selenium Comparison to GWPS



Time Series Analysis Run 5/17/2023 4:07 PM

Client: Consumers Energy Data: 2Q23_JHC_Sanitas

Summary Report

Constituent: Selenium, Total Analysis Run 5/17/2023 4:11 PM
Client: Consumers Energy Data: 2Q23_JHC_Sanitas

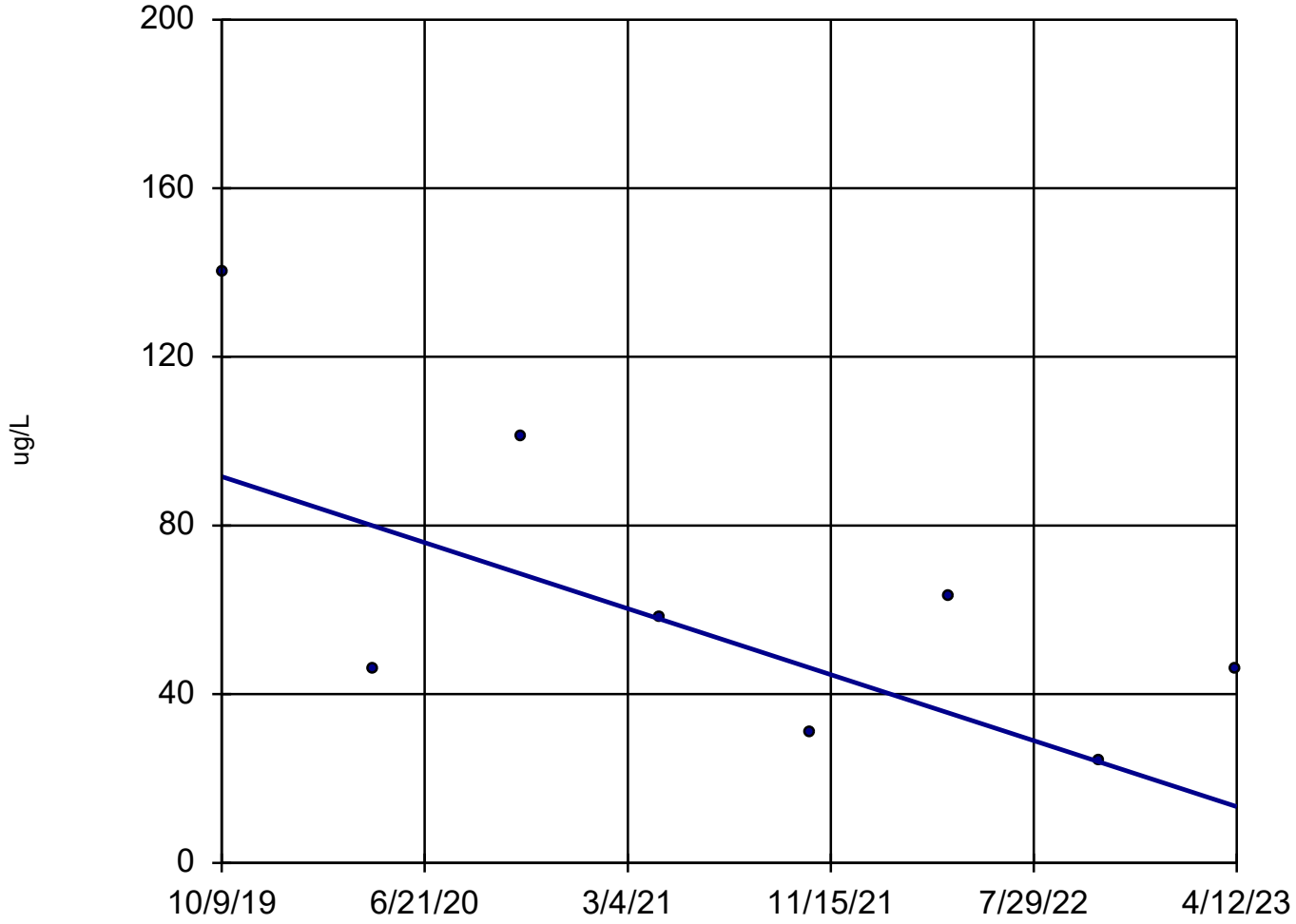
For observations made between 10/9/2019 and 4/12/2023, a summary of the selected data set:

Observations = 19
NDs = 0%
Wells = 3
Minimum Value = 18
Maximum Value = 140
Mean Value = 46.53
Median Value = 38
Standard Deviation = 29
Coefficient of Variation = 0.6233
Skewness = 2.163

Well	#Obs.	NDs	Min	Max	Mean	Median	Std.Dev.	CV	Skewness
JHC-MW-18004	8	0%	18	44	32.63	33.5	7.745	0.2374	-0.5162
JHC-MW-18005	8	0%	24	140	63.63	52	38.76	0.6092	1.022
JHC-MW-22001	3	0%	31	45	38	38	7	0.1842	0

Selenium, Total

JHC-MW-18005



n = 8

Slope = -22.31 units per year.

Mann-Kendall statistic = -13
critical = -20

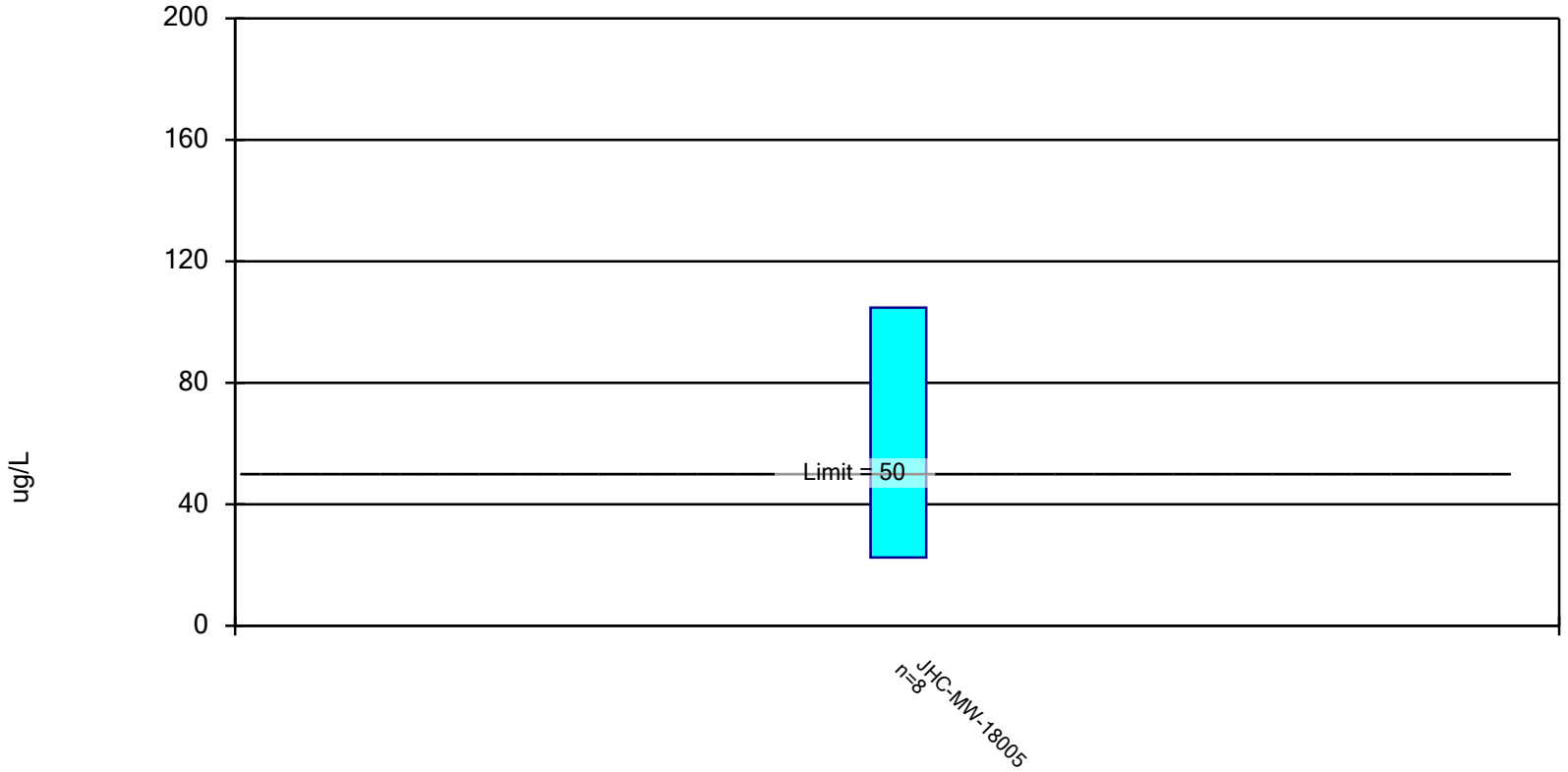
Trend not significant at 98% confidence level (α = 0.01 per tail).

Sen's Slope Estimator Analysis Run 5/17/2023 4:09 PM

Client: Consumers Energy Data: 2Q23_JHC_Sanitas

Parametric Confidence Interval

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



Constituent: Selenium, Total Analysis Run 5/17/2023 4:10 PM

Client: Consumers Energy Data: 2Q23_JHC_Sanitas

Confidence Interval

Constituent: Selenium, Total (ug/L) Analysis Run 5/17/2023 4:10 PM

Client: Consumers Energy Data: 2Q23_JHC_Sanitas

	JHC-MW-18005
10/9/2019	140
4/16/2020	46
10/22/2020	101 (D)
4/13/2021	58
10/22/2021	31
4/13/2022	63 (D)
10/20/2022	24
4/12/2023	46
Mean	63.63
Std. Dev.	38.76
Upper Lim.	104.7
Lower Lim.	22.54