



2020 Annual Groundwater Monitoring and Corrective Action Report

**JH Campbell Power Plant
Pond A**

West Olive, Michigan

January 2021

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1.0 Program Summary

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) Pond A CCR Unit at the JH Campbell Power Plant Site (JHC Pond A). 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 Report for JHC Pond A to cover the period of January 1, 2020 to December 31, 2020.

During the statistical evaluation of the initial assessment monitoring event (June 2018), arsenic was present in one or more downgradient monitoring wells at statistically significant levels exceeding the Groundwater Protection Standard (GWPS). Therefore, Consumers Energy initiated an Assessment of Corrective Measures (ACM) within 90 days from when the Appendix IV exceedance was determined. The ACM was completed on September 11, 2019. Consumers Energy will continue to evaluate corrective measures per §257.96 and §257.97 and is continuing semiannual assessment monitoring in accordance with §257.95. Pond A was in assessment monitoring at the beginning and at the end of the period covered by this report. Data that have been collected and evaluated in 2020 are presented in this report.

Consumers Energy will continue to evaluate corrective measures in accordance with §257.96 and §257.97. The groundwater management remedy for Pond A will be selected as soon as feasible to, at a minimum, meet the federal standards of §257.97(b) of the CCR Rule. Consumers Energy will continue executing the self-implementing groundwater compliance schedule in conformance with §257.90 - §257.98. The next semiannual assessment monitoring event is tentatively scheduled for the second calendar quarter of 2021.

2.0 Groundwater Monitoring

Per §257.95, all wells in the CCR unit monitoring program must be sampled at least semiannually. One semiannual event must include analysis for all constituents from Appendix III and Appendix IV constituents and one semiannual event may include analysis for all constituents in Appendix III and those constituents in Appendix IV of the CCR Rule that were detected during prior sampling. The 2020 semiannual assessment monitoring events at Pond A were completed in April and October 2020 to comply with both the CCR Rule and the Michigan Department of Environment, Great Lakes, and Energy (EGLE)-approved monitoring program established for Pond A in 2019. Given the congruencies between the two programs, data collected and evaluated under both programs are presented together in the semiannual reports.

2.1 First Semiannual Monitoring Event

A summary of the first semiannual groundwater monitoring event is provided in Appendix A.

2.2 Second Semiannual Monitoring Event

A summary of the second semiannual groundwater monitoring event is provided in Appendix B.

3.0 Corrective Action

3.1 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. A technical memorandum summarizing the nature and extent groundwater data collected in 2020 for Pond A is included in Appendix C.

3.2 Assessment of Corrective Measures

The ACM was completed on September 11, 2019 as a step towards developing a final remedy.

Several groundwater remediation alternatives evaluated in the ACM are considered technically feasible to reduce on-site groundwater concentrations. The following corrective measures were retained for further evaluation in conjunction with closure in place for Pond A:

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

Consumers Energy plans to utilize an adaptive management strategy for selecting the final groundwater remedy for Pond A 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 may be implemented to address existing conditions followed by monitoring and evaluation of the performance after closure. Adjustments will be made to the corrective measure remedy, as needed, to achieve the remedial goals (e.g. GWPS and/or risk/exposure/pathway-based criteria).

3.3 Remedy Selection

Consumers Energy has not selected a remedy pursuant to §257.97. The semiannual progress report describing the progress in selecting and designing the remedy required pursuant to §257.97(a) is included in Appendix D. Pond A has been closed according to the *JH Campbell Generating Facility Pond A Closure Plan, West Olive, Michigan* (Golder, October 2016) and the updated closure plan detailing the final cover system that was submitted to the EGLE in February 2019. Pond A was closed with waste place in accordance with the requirements for CCR landfills under RCRA (§257.102(d)). Cover construction was completed in summer 2019 and the Closure Certification Report was approved by the EGLE on November 25, 2019. Changes in groundwater chemistry continue to be evaluated following the completion of capping

at Pond A. Groundwater monitoring in 2021 will reduce uncertainty surrounding potential changes in redox conditions and the effect on contaminant transport. These observations will be critical for the comparison of corrective measures alternatives.

Appendix A

First Semiannual Monitoring Report



**2020 Semiannual
Groundwater Monitoring
Report and Second
Quarter 2020
Hydrogeological
Monitoring Report**

**JH Campbell Power Plant
Pond A CCR Unit**

West Olive, Michigan

July 2020

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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 Pond A CCR Unit at the JH Campbell Power Plant Site (JHC Pond A).

On December 28, 2018, the State of Michigan enacted Public Act No. 640 of 2018 (PA 640) to amend the Natural Resources and Environmental Protection Act, also known as Part 115 of PA 451 of 1994, as amended (a.k.a., Michigan Part 115 Solid Waste Management). On March 18, 2019, Consumers Energy submitted the *Pond A Hydrogeological Monitoring Plan, JH Campbell Power Plant, West Olive, Michigan* (Pond A HMP) (TRC, March 2019; Revised July 2019), which includes the *Pond A Assessment Monitoring Plan* (Pond A AMP), to EGLE to comply with the requirements of Part 115, Rule 299.4905 and the December 21, 2018 Consent Agreement No. 115-01-2018. The Pond A HMP and AMP were revised per EGLE comments on July 30, 2019 and approved by EGLE on August 13, 2019.

On behalf of Consumers Energy, TRC has prepared this 2020 Semiannual Groundwater Monitoring Report and Second Quarter 2020 Hydrogeological Monitoring Report for the JH Campbell Pond A CCR Unit (Semiannual Report) to cover the semiannual monitoring conducted in April 2020 to comply with the CCR Rule and the Pond A HMP and AMP. Pond A remains in assessment monitoring. Given the alignment of PA 640 to comply with the RCRA CCR Rule and the congruencies between the two programs, data collected and evaluated under both programs are presented together in this report.

1.1 Statement of Adherence to Approved Hydrogeological Monitoring Plan

This JH Campbell Pond A Second Quarter 2020 Hydrogeological Monitoring Report (Semiannual Report) has been prepared by TRC on behalf of Consumers Energy to present groundwater monitoring data collected from the JH Campbell Pond A. This report was prepared in accordance with the items listed in Appendix A (Solid Waste Monitoring Submittal Components) of the May 15, 2015 Michigan Department of Environmental Quality - Office of Waste Management and Radiological Protection (MDEQ-OWMRP), now the Michigan Department of Environment, Great Lakes, and Energy (EGLE) Materials Management Division (MMD) communication prescribing the format for solid waste disposal facility monitoring submittals as published in OWMRP-115-29, dated July 5, 2013 Format for Solid Waste Disposal Monitoring Submittals. All references herein to the EGLE are inclusive of the MDEQ. Information contained in this report was prepared in adherence to the July 2019 Pond A HMP and AMP, approved by the EGLE on August 13, 2019.

1.2 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, Pond A CCR Unit* (TRC, January 2018). The statistical evaluation of the Appendix III

indicator parameters confirming SSIs over background were as follows:

- Boron at JHC-MW-15006, JHC-MW-15007, JHC-MW-15008, JHC-MW-15009, JHC-MW-15010, and JHC-MW-15011; and
- Sulfate at JHC-MW-15006, JHC-MW-15007, JHC-MW-15008, JHC-MW-15009, JHC-MW-15010, and JHC-MW-15011.

As discussed in the *2018 Annual Groundwater Monitoring Report for the JH Campbell Power Plant Pond A CCR Unit* (2018 Annual Report) (TRC, January 2019), Consumers Energy initiated an Assessment Monitoring Program for Pond A pursuant to §257.95 of the CCR Rule that included sampling and analyzing groundwater within the groundwater monitoring system for all constituents listed in Appendix III and Appendix IV. After subsequent sampling for Appendix IV constituents, Consumers Energy provided notification that arsenic was present at statistically significant levels above the federal groundwater protection standards (GWPS) established at 10 ug/L (TRC, 2019) in one out of six downgradient monitoring wells at Pond A as follows:

- Arsenic at JHC-MW-15011.

The CCR Rule 40 CFR §257.96(a) requires that an owner or operator initiate an assessment of corrective measures (ACM) 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* (ACM) (TRC, September 2019) was initiated on April 15, 2019 and was certified and submitted to EGLE on September 11, 2019 in accordance with the schedule in §257.96. In addition, Consumers Energy is preparing a site-wide remedial action plan (RAP) for the JH Campbell site per the Consent Agreement No. 115-01-2018 executed by Consumers Energy and the EGLE on December 21, 2018.

Consumers Energy will continue to evaluate corrective measures in accordance with §257.96 and §257.97 as outlined in the ACM and will continue executing the self-implementing groundwater compliance schedule in conformance with §257.90 - §257.98, which includes semiannual assessment monitoring in accordance with §257.95. In addition, quarterly monitoring is performed in accordance with the Pond A HMP and AMP under Part 115. The initial implementation of the Pond A HMP and AMP was presented in the 2019 Annual Groundwater Monitoring and Corrective Action Report and Fourth Quarter 2019 Hydrogeological Monitoring Report (2019 Annual Report) (TRC, January 2020). This Semiannual Report presents the results of the second quarter 2020 Pond A HMP and AMP event, which also serves as the first semiannual assessment monitoring event for 2020 conducted in accordance with §257.95.

1.3 Site Overview

The JH Campbell 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.

1.4 Geology/Hydrogeology

The upgradient/background wells are located to the north-northwest of the JHC Dry Ash Landfill. Groundwater is typically encountered around 30 to 35 feet below ground surface (ft bgs), except in the recently excavated areas of Bottom Ash Ponds 1-2 and Bottom Ash Pond 3 South where groundwater is now within 5 to 10 ft bgs due to grade changes, 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

Consumers Energy established a groundwater monitoring system for the JHC Pond A, which consists of 12 monitoring wells (six background monitoring wells and six 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 CCR management at the site (JHC-MW-15023 through JHC-MW-15028). The six downgradient wells (JHC-MW-15006, JHC-MW-15007, JHC-MW-15008R, JHC-MW-15009, JHC-MW-15010, and JHC-MW-15011) are located south and southeast of Pond A.

As shown on Figure 2, monitoring wells JHC-MW-15029 and JHC-MW-15030 are used for water level measurements only.

2.2 April 2020 Assessment Monitoring

Consumers Energy personnel performed gauging and sampling of monitoring wells associated with Pond A from April 13 through April 16, 2020. Per §257.95(d), all wells in the CCR monitoring program must be sampled at least semiannually. Groundwater monitoring was performed in accordance with the approved Pond A HMP and AMP and the *JH Campbell Monitoring Program Sample Analysis Plan (SAP)* (ARCADIS, May 2016). Groundwater samples collected during the April 2020 event were submitted to Consumers Energy Laboratory Services in Jackson, Michigan, for analysis of the following metals and inorganic indicator constituents:

Section 11511a(3)(c) – Detection Monitoring Constituents	Section 11519b(2) – Assessment Monitoring Constituents
Boron Calcium Chloride Fluoride Iron pH Sulfate Total Dissolved Solids (TDS)	Antimony Arsenic Barium Beryllium Cadmium Chromium, total Cobalt Copper Fluoride Lead Lithium Mercury Molybdenum

Section 11511a(3)(c) – Detection Monitoring Constituents	Section 11519b(2) – Assessment Monitoring Constituents
	Nickel Radium 226 and 228 Selenium Silver Thallium Vanadium Zinc

Static water level measurements were collected at all locations after equilibration to atmospheric pressure. The depth to water was measured according to ASTM D 4750, “Standard Test Method for Determining Subsurface Liquid Levels in a Borehole or Monitoring Well” and recorded to the nearest 0.01 foot. Static water elevation data are included in the attached field records (Appendix E) and summarized in Table 1.

Groundwater samples were collected using a peristaltic pump or submersible pump in accordance with low flow sampling protocol and were not field filtered to allow for total metals analysis. In addition, field parameters including dissolved oxygen, oxidation reduction potential, specific conductivity, temperature, and turbidity were collected at each well as shown on Table 2. All samples were collected in vendor-provided, nitric acid pre-preserved (metals only) and unpreserved sample containers and submitted to the laboratory for analysis. Consumers Energy followed chain of custody procedures to document the sample handling.

Monitoring well MW-13 had an insufficient amount of groundwater present to collect a sample during this sampling event for the Pond A HMP and AMP program; however, a sample was able to be collected and analyzed for several dissolved metals (boron, antimony, arsenic, chromium, lithium, molybdenum, selenium, nickel, vanadium) in accordance with the September 1996 *Hydrogeological Monitoring Plan (HMP) for JH Campbell Ash Storage Facility, Consumers Power Company, Solid Waste Disposal Area, Coal Ash, Type III* at several monitoring wells sampled under both programs during the week of April 13, 2020. These results are reported in the *Second Quarter 2020 Groundwater Monitoring Report JH Campbell Solid Waste Disposal Area, West Olive, Michigan* prepared by TRC in July 2020 and, for the relevant Pond A wells, are also included in this quarterly monitoring report given that several of the constituents are the same for both programs (noted as dissolved).

Consumers Energy collected quality assurance/quality control (QA/QC) samples during the April 2020 groundwater sampling event. The QA/QC samples consisted of two field blanks, two equipment blanks, three field duplicates (JHC-MW-15009, JHC-MW-15023, and PZ-40S), and three field matrix spike/matrix spike duplicate (MS/MSD) samples collected from JHC-MW-15007, JHC-MW-15025, and TW-19-04A.

2.2.1 Analytical Data and Relevant Screening Criteria

Analytical results from the second quarter 2020 monitoring event are included in the attached laboratory reports (Appendix D). Second quarter 2020 groundwater analytical data is summarized in Table 3 (background monitoring wells), Table 4 (downgradient monitoring wells), and Table 5 (GSI monitoring wells), as well as the associated Part 201 generic drinking water criteria and generic GSI criteria.

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 Pond A HMP and AMP program. The data quality reviews are summarized in Appendix A.

2.2.3 Groundwater Flow Rate and Direction

Groundwater elevations measured across the Site during the April 2020 event using several wells throughout the RCRA CCR well network are provided on Table 1. April 2020 groundwater elevations were used to construct the groundwater contour map provided on Figure 3. The average hydraulic gradient of 0.0044 ft/ft was calculated using the following well pairs: JHC-MW-15027/JHC-MW-15028, JHC-MW-15026/JHC-MW-15007, and JHC-MW-15008R/MW-14S (Figure 2). Using the mean hydraulic conductivity of 62 ft/day (ARCADIS, 2016) and an assumed effective porosity of 0.4, the estimated average seepage velocity is approximately 0.68 ft/day or 250 ft/year for the April 2020 event.

The general groundwater flow direction is similar to that identified in previous monitoring rounds and continues to demonstrate that the downgradient wells are appropriately positioned to detect the presence of constituents that could potentially migrate from Pond A.

3.0 Statistical Evaluation

Assessment monitoring is continuing at Pond A in accordance with the AMP while corrective measures are further 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 second quarter 2020 groundwater data in accordance with the assessment monitoring program. The statistical evaluation details are provided in Appendix B (*Statistical Evaluation of April 2020 Assessment Monitoring Sampling Event*).

3.1 Establishing Groundwater Protection Standards

The Appendix IV GWPSs are used to assess Appendix IV constituent concentrations present in groundwater 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 Appendix IV GWPSs is documented in the *Groundwater Protection Standards* technical memorandum included in Appendix C of the 2018 Annual Report.

Pursuant to the Pond A AMP, GWPSs were established for the Appendix III constituents in accordance with 40 CFR 257.95(h)¹. The calculation of the Appendix III GWPSs is documented in the *Groundwater Protection Standards* technical memorandum included in Appendix G of the 2019 Annual Report. Per the Pond A AMP, GWPSs will be established for the Section 11511a(3) constituents not included in Appendix III of the CCR rule (i.e. iron) and the Section 11519b(2) constituents not included in Appendix IV of the CCR rule (i.e. copper, nickel, silver, vanadium, and zinc) following the collection of a minimum of four independent data points.

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)*, arsenic was present at statistically significant levels above the GWPSs in one of the six downgradient wells (JHC-MW-15011) at Pond A based on the statistical data comparison for the first semiannual assessment monitoring event (June 2018), included as Appendix D of the 2019 Annual Report.

The second quarter 2020 statistical evaluation confirms that arsenic at JHC-MW-15011 is the only Appendix IV constituent present at statistically significant levels above the GWPSs. As shown in the data tables and trend tests included in Appendix B, arsenic concentrations at monitoring well JHC-MW-15011 showed a general increase in 2018 and 2019. Arsenic concentrations in this well have begun to decline in 2020 but remain above the GWPSs. A summary of the confidence intervals for April 2020 are provided in Table 6. Table 7 provides a summary of the statistically significant GWPS exceedances over the most recent four

¹ As amended per Phase One, Part One of the CCR Rule (83 FR 36435).

monitoring events.

No other constituents were observed at statistically significant levels exceeding the Appendix III or Appendix IV GWPSs in downgradient monitoring wells at the JHC Pond A during the second quarter 2020.

Groundwater chemistry is currently changing as a result of closure activities performed at Pond A. As discussed in the ACM, Pond A has been decommissioned with final cover in place in the summer of 2019, and groundwater flow direction has changed such that groundwater generally flows to the south-southeast and mounding is no longer observed as it had been when hydraulic loading was actively taking place. The cessation of hydraulic loading and recharge of the aquifer are expected to have an influence on groundwater conditions, and many Appendix III and Appendix IV constituents may be affected by this change. Groundwater conditions will continue to be monitored while corrective measures continue to be evaluated and a remedy is selected. Groundwater monitoring in 2020 may reduce uncertainty surrounding the potential changes in groundwater oxidation-reduction conditions and the effect on contaminant transport. These observations will be critical for the comparison of corrective measures alternatives.

3.3 GSI Compliance Monitoring Trends

Pursuant to the AMP, trend tests will be used to evaluate groundwater quality at the GSI monitoring wells. The GSI monitoring wells will be evaluated for detected constituents (antimony, arsenic, barium, chromium (total), lithium, molybdenum, and selenium) that, based on monitoring data from Pond A, have the potential to exceed generic GSI criteria at the Pond A downgradient monitoring wells as detailed in the AMP. An insufficient number of data points exist for the GSI monitoring wells to complete a statistical evaluation of trends at all locations for second quarter 2020. Trend analysis will be completed following the collection of a minimum of four sampling events under the CCR monitoring program and the Pond A AMP². In the interim, time-series plots for the GSI monitoring wells MW-13, MW-14S, PZ-24S, and PZ-40S, including assessment monitoring data collected from June 2018 through April 2020³ for the aforementioned GSI monitoring constituents detailed in the Pond A AMP, are included in Appendix C.

All of the constituent concentrations at the GSI monitoring wells are below their respective Part 201 generic GSI criteria in April 2020 (Table 5) and there are no apparent trends based on review of the available data shown on the time series plots (Appendix C).

² Consistent with the Unified Guidance, a minimum of four observations, preferably eight or more, is required to construct trends using the Sen's Slope estimator.

³ An insufficient amount of groundwater was present in February and April 2020 to collect sample for total metals for MW-13. Select dissolved metal results collected at MW-13 in accordance with the JH Campbell Dry Ash Landfill Hydrogeological Monitoring Plan (HMP) are included in the time-series plots for February and April 2020.

4.0 Conclusions and Recommendations

Assessment monitoring is ongoing at Pond A while corrective action continues to be assessed. Pond A has been decommissioned and the final cover has been placed. Overall, the statistical evaluations have confirmed that arsenic is the only Appendix IV constituent present at statistically significant levels above the GWPSs and compliance for the GSI pathway is currently met based on data collected from the GSI monitoring wells located downgradient from Pond A.

The ACM also documents that groundwater nature and extent have been defined, as required in §257.95(g)(1). Although arsenic concentrations had exceeded 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 Pond A.

Consumers Energy has also completed the final cover for Pond A in summer of 2019. The ACM report provided a high-level assessment of groundwater remediation technologies that could potentially address site-specific constituents of concern (i.e. arsenic) under known groundwater conditions. Changes in groundwater chemistry continue to be evaluated following the completion of capping at Pond A. Groundwater monitoring in 2020 will reduce uncertainty surrounding potential changes in groundwater oxidation-reduction conditions and the effect on contaminant transport. These observations will be critical for the comparison of corrective measures alternatives.

Consumers Energy will continue to evaluate corrective measures in accordance with §257.96 and §257.97. The groundwater management remedy for the JHC Pond A will be selected as soon as feasible to, at a minimum, meet the federal standards of §257.97(b) of the CCR Rule. Consumers Energy will continue executing the self-implementing groundwater compliance schedule in conformance with §257.90 - §257.98. The next quarterly Pond A HMP and AMP monitoring events are scheduled for July and October 2020.

5.0 References

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Minimum Criteria (Phase One, Part One); Final Rule. 83 Federal Register 146 (July 30, 2018), pp. 36435-36456 (83 FR 36435).

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Tables

Table 1
 Summary of Groundwater Elevation Data – Second Quarter 2020
 JH Campbell – Assessment Monitoring Program
 West Olive, Michigan

Well Location	Ground Surface Elevation (ft)	TOC Elevation (ft)	Geologic Unit of Screen Interval	Screen Interval Elevation (ft)		April 13, 2020	
						Depth to Water (ft BTOC)	Groundwater Elevation (ft)
Background							
JHC-MW-15023	617.01	619.98	Sand	603.0	to 593.0	15.00	604.98
JHC-MW-15024	613.79	616.62	Sand	606.8	to 596.8	9.92	606.70
JHC-MW-15025	614.14	617.17	Sand	607.1	to 597.1	8.93	608.24
JHC-MW-15026	615.09	618.04	Sand	607.1	to 597.1	10.61	607.43
JHC-MW-15027	614.77	617.30	Sand	604.8	to 594.8	10.87	606.43
JHC-MW-15028	611.02	613.80	Sand	603.0	to 593.0	11.51	602.29
JHC-MW-15029	608.08	610.95	Sand	600.1	to 590.1	9.60	601.35
JHC-MW-15030	604.05	607.17	Sand	600.1	to 590.1	8.22	598.95
Pond 1N, 1S, 2N, 2S							
JHC-MW-15001	607.02	609.53	Sand	603.5	to 598.5	11.41	598.12
JHC-MW-15002	618.18	621.27	Sand	590.2	to 580.2	23.88	597.39
JHC-MW-15003	623.16	627.20	Sand	595.2	to 585.2	32.35	594.85
JHC-MW-15005	606.22	609.99	Sand	579.2	to 569.2	18.01	591.98
JHC-MW-18004	602.92	605.72	Sand	596.9	to 586.9	11.33	594.39
JHC-MW-18005	600.30	603.16	Sand	595.3	to 585.3	10.18	592.98
Pond 3N, 3S							
JHC-MW-15013	632.40	635.25	Sand	604.4	to 594.4	34.28	600.97
JHC-MW-15015	632.46	635.20	Sand	604.5	to 594.5	33.44	601.76
JHC-MW-15016	631.81	632.52	Sand	603.8	to 593.8	30.70	601.82
JHC-MW-18001	609.09	611.98	Sand	603.1	to 593.1	11.04	600.94
JHC-MW-18002	605.53	608.93	Sand	602.0	to 592.0	8.37	600.56
JHC-MW-18003	605.36	608.78	Sand	601.9	to 591.9	8.30	600.48
Landfill							
JHC-MW-15017	613.69	616.61	Sand	603.7	to 593.7	13.05	603.56
JHC-MW-15018	614.26	617.02	Sand	604.3	to 594.3	13.80	603.22
JHC-MW-15019	609.81	612.86	Sand	603.8	to 593.8	10.22	602.64
JHC-MW-15022	620.92	623.79	Sand	597.9	to 587.9	27.28	596.51
JHC-MW-15031	632.94	635.87	Sand	599.9	to 589.9	41.84	594.03
JHC-MW-15032	611.32	614.29	Sand	598.3	to 588.3	15.31	598.98
JHC-MW-15033	618.08	620.99	Sand	602.1	to 592.1	19.89	601.10
JHC-MW-15034	612.90	615.97	Sand	601.9	to 591.9	13.55	602.42
JHC-MW-15035	632.53	634.28	Sand	599.5	to 589.5	39.11	595.17
JHC-MW-15036	617.94	618.34	Sand	597.9	to 587.9	25.43	592.91
JHC-MW-15037	614.28	616.06	Sand	591.3	to 586.3	23.97	592.09
Pond A							
JHC-MW-15006	624.74	627.58	Sand	599.7	to 589.7	33.65	593.93
JHC-MW-15007	624.82	627.70	Sand	602.8	to 592.8	33.95	593.75
JHC-MW-15008	632.43	635.30	Sand	604.4	to 594.4	Decommissioned	
JHC-MW-15008R ⁽³⁾	632.32	634.67	Sand	597.3	to 587.3	41.46	593.21
JHC-MW-15009	632.33	635.32	Sand	602.3	to 592.3	41.77	593.55
JHC-MW-15010	632.55	635.57	Sand	602.6	to 592.6	41.28	594.29
JHC-MW-15011	627.71	630.83	Sand	600.7	to 590.7	37.83	593.00
Downgradient Wells							
MW-13	593.40	595.37	Clayey Silt	587.9	to 585.4	9.59	585.78
MW-14S	587.36	590.98	Sand	582.9	to 577.9	8.38	582.60
PZ-23S	602.84	604.97	Sand	591.8	to 586.8	14.81	590.16
PZ-24S	586.56	590.15	Sand	584.6	to 579.6	7.94	582.21
PZ-40S	589.51	593.25	Sand	585.5	to 575.5	9.86	583.39
TW-19-04A	608.15	611.44	Sand	591.2	to 586.2	20.85	590.59
TW-19-05	603.44	606.36	Sand	592.8	to 587.8	14.37	591.99
TW-19-06A	599.61	602.54	Sand	592.3	to 587.3	11.81	590.73

Notes:

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

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.

--: Not measured

Table 2
 Summary of Field Parameters: Second Quarter 2020
 JH Campbell Pond A – Assessment Monitoring Program
 West Olive, Michigan

Sample Location	Sample Date	Dissolved Oxygen ppm	Oxidation Reduction Potential mV	pH su	Specific Conductivity umhos/cm	Temperature deg C	Turbidity ntu
Background							
JHC-MW-15023	4/16/2020	0.81	208.9	5.4	84	8.2	0.0
JHC-MW-15024	4/16/2020	0.87	203.3	6.5	321	7.5	0.0
JHC-MW-15025	4/16/2020	4.19	193.8	6.2	215	7.2	0.0
JHC-MW-15026	4/16/2020	2.86	189.4	6.4	185	8.1	0.0
JHC-MW-15027	4/16/2020	4.13	147.2	5.6	59	7.7	2.8
JHC-MW-15028	4/16/2020	7.13	186.4	6.0	82	8.8	0.0
Pond A							
JHC-MW-15006	4/14/2020	0.36	-11.6	7.2	807	13.7	0.0
JHC-MW-15007	4/14/2020	3.82	69.7	7.0	545	13.3	0.0
JHC-MW-15008R	4/14/2020	1.41	56.0	6.9	824	13.8	1.3
JHC-MW-15009	4/14/2020	3.52	66.6	7.2	587	14.3	0.3
JHC-MW-15010	4/14/2020	2.78	132.1	6.6	555	13.1	0.0
JHC-MW-15011	4/15/2020	0.32	-122.9	7.6	803	14.0	0.5
Pond A GSI							
MW-13	4/13/2020 ⁽¹⁾	--	--	7.5	56	--	--
MW-14S	4/16/2020	3.72	152.4	5.0	24	8.5	1.6
PZ-24S	4/16/2020	3.24	107.6	5.0	31	7.1	1.3
PZ-40S	4/16/2020	1.29	198.3	4.4	23	7.0	1.4

Notes:

mg/L - Milligrams per Liter.

mV - Millivolts.

SU - Standard units

umhos/cm - Micromhos per centimeter.

°C - Degrees Celcius

NTU - Nephelometric Turbidity Unit.

-- - Not sampled.

(1) - Insufficient amount of groundwater present to collect sample for total metals. Reported results are from sampling completed in accordance with the JH Campbell Dry Ash Landfill Hydrogeological Monitoring Plan (HMP).

Table 3
 Summary of Groundwater Sampling Results (Analytical): Second Quarter 2020
 JH Campbell Background – Assessment 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:	4/16/2020	4/16/2020	4/16/2020	4/16/2020	4/16/2020	4/16/2020
Constituent	Unit	EPA MCL	MI Residential*	MI Non-Residential*	MI GSI [^]							
Appendix III												
Boron	ug/L	NC	500	500	7,200	45	22	26	< 20	< 20	< 20	< 20
Calcium	mg/L	NC	NC	NC	500	9.59	32.8	16.1	16.6	7.78	11.1	11.1
Chloride	mg/L	250**	250	250	500	1.84	20.1	15.8	7.21	< 1.00	< 1.00	< 1.00
Fluoride	ug/L	4,000	NC	NC	NC	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	250**	250	250	500	9.75	6.26	8.63	6.94	7.86	5.22	5.22
Total Dissolved Solids	mg/L	500**	500	500	500	56	158	98	76	37	42	42
pH, Field	SU	6.5 - 8.5**	6.5 - 8.5	6.5 - 8.5	6.5 - 9.0	5.4	6.5	6.2	6.4	5.6	6.0	6.0
Appendix IV												
Antimony	ug/L	6	6.0	6.0	130	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Arsenic	ug/L	10	10	10	10	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Barium	ug/L	2,000	2,000	2,000	820	20	18	20	15	25	14	14
Beryllium	ug/L	4	4.0	4.0	18	< 1	< 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	< 0.2
Chromium	ug/L	100	100	100	11	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Cobalt	ug/L	NC	40	100	100	< 15	< 6	< 6	< 15	< 6	< 15	< 15
Fluoride	ug/L	4,000	NC	NC	NC	< 1,000	< 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	< 1
Lithium	ug/L	NC	170	350	440	< 10	< 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	< 0.2
Molybdenum	ug/L	NC	73	210	3,200	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Radium-226	pCi/L	NC	NC	NC	NC	< 0.165	< 0.222	< 0.280	< 0.139	< 0.184	< 0.262	< 0.262
Radium-228	pCi/L	NC	NC	NC	NC	< 0.634	< 0.717	< 1.90	< 0.676	< 1.37	< 0.651	< 0.651
Radium-226/228	pCi/L	5	NC	NC	NC	< 0.634	< 0.717	< 1.90	< 0.676	< 1.37	< 0.651	< 0.651
Selenium	ug/L	50	50	50	5.0	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Thallium	ug/L	2	2.0	2.0	3.7	< 2	< 2	< 2	< 2	< 2	< 2	< 2
MI Part 115 Parameters												
Iron	ug/L	300**	300 ⁽¹⁾	300 ⁽¹⁾	500,000	38	182	33	25	33	29	29
Copper	ug/L	1,000**	1,000 ⁽¹⁾	1,000 ⁽¹⁾	15	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Nickel	ug/L	NC	100	100	86	< 1	< 2	< 2	< 1	< 2	< 1	< 1
Silver	ug/L	100**	34	98	0.20	< 0.2	< 0.3	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Vanadium	ug/L	NC	4.5	62	27	< 2	< 2	< 2	< 2	< 2	< 2	< 2
Zinc	ug/L	5,000**	2,400	5,000 ⁽¹⁾	190	< 10	< 10	< 10	< 10	< 10	< 10	< 10

Notes:

ug/L - micrograms per liter.

mg/L - milligrams per liter.

SU - standard units; pH is a field parameter.

pCi/L - picocuries per liter.

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 30, 2013.

** - 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 EGLE policy and procedure 09-014 dated June 20, 2012.

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.

(1) - Criterion is the aesthetic drinking water value per footnote {E}.

Table 4
 Summary of Groundwater Sampling Results (Analytical): Second Quarter 2020
 JH Campbell Pond A – Assessment Monitoring Program
 West Olive, Michigan

Sample Location:						JHC-MW-15006	JHC-MW-15007	JHC-MW-15008R	JHC-MW-15009	JHC-MW-15010	JHC-MW-15011
Sample Date:						4/14/2020	4/14/2020	4/14/2020	4/14/2020	4/14/2020	4/15/2020
Constituent	Unit	EPA MCL	MI Residential*	MI Non-Residential*	MI GSI^						
Appendix III											
Boron	ug/L	NC	500	500	7,200	284	242	505	874	2,350	2,870
Calcium	mg/L	NC	NC	NC	500	102	62.1	99.9	78.7	82.7	112
Chloride	mg/L	250**	250	250	500	24.9	14.1	25.0	6.95	3.20	4.16
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	250	500	260	83.0	235	49.1	35.9	183
Total Dissolved Solids	mg/L	500**	500	500	500	562	336	566	354	333	542
pH, Field	SU	6.5 - 8.5**	6.5 - 8.5	6.5 - 8.5	6.5 - 9.0	7.2	7.0	6.9	7.2	6.6	7.6
Appendix IV											
Antimony	ug/L	6	6.0	6.0	130	1	< 1	1	1	< 1	4
Arsenic	ug/L	10	10	10	10	5	3	< 1	< 1	< 1	25
Barium	ug/L	2,000	2,000	2,000	820	353	266	252	307	276	514
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	2	< 1	1	1	< 1
Cobalt	ug/L	NC	40	100	100	< 15	< 15	< 15	< 15	< 15	< 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	14	19	14	20	21
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	16	< 5	< 5	< 5	< 5	7
Radium-226	pCi/L	NC	NC	NC	NC	0.426	0.197	0.180	0.394	0.270	0.242
Radium-228	pCi/L	NC	NC	NC	NC	0.518	< 0.456	< 0.429	0.573	0.752	0.606
Radium-226/228	pCi/L	5	NC	NC	NC	0.944	< 0.456	0.549	0.967	1.02	0.848
Selenium	ug/L	50	50	50	5.0	9	22	6	77	158	29
Thallium	ug/L	2	2.0	2.0	3.7	< 2	< 2	< 2	< 2	< 2	< 2
MI Part 115 Parameters											
Iron	ug/L	300**	300 ⁽¹⁾	300 ⁽¹⁾	500,000	26	< 20	134	< 20	< 20	145
Copper	ug/L	1,000**	1,000 ⁽¹⁾	1,000 ⁽¹⁾	15	1	1	2	1	1	1
Nickel	ug/L	NC	100	100	86	1	< 1	< 1	< 1	< 1	< 2
Silver	ug/L	100**	34	98	0.20	< 0.4	< 0.2	< 0.2	< 0.2	< 0.2	< 0.4
Vanadium	ug/L	NC	4.5	62	27	10	14	< 2	< 2	4	40
Zinc	ug/L	5,000**	2,400	5,000 ⁽¹⁾	190	< 10	< 10	< 10	< 10	< 10	< 10

Notes:

- ug/L - micrograms per liter.
- mg/L - milligrams per liter.
- SU - standard units; pH is a field parameter.
- pCi/L - picocuries per liter.
- 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 30, 2013.
- ** - 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 EGLE policy and procedure 09-014 dated June 20, 2012.
- 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.
- (1) - Criterion is the aesthetic drinking water value per footnote {E}.

Table 5
 Summary of Groundwater Sampling Results (Analytical): Second Quarter 2020
 JH Campbell Pond A GSI - Assessment Monitoring Program
 West Olive, Michigan

Constituent	Unit	EPA MCL	MI Residential*	MI Non-Residential*	MI GSI [^]	Sample Location:	MW-13	MW-14S	PZ-24S	PZ-40S
						Sample Date:	4/13/2020 ⁽¹⁾	4/16/2020	4/16/2020	4/16/2020
Antimony	ug/L	6	6.0	6.0	130		< 1	< 1	< 1	< 1
Arsenic	ug/L	10	10	10	10		< 1	< 1	< 1	< 1
Barium	ug/L	2,000	2,000	2,000	820		--	8	24	22
Chromium	ug/L	100	100	100	11		< 1	< 1	2	1
Lithium	ug/L	NC	170	350	440		20	< 10	< 10	< 10
Molybdenum	ug/L	NC	73	210	3,200		< 5	< 5	< 5	< 5
Selenium	ug/L	50	50	50	5.0		2	< 1	< 1	< 1

Notes:

ug/L - micrograms per liter.

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 30, 2013.

[^] - 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}.

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.

(1) - Insufficient amount of groundwater present to collect sample for total metals. Reported results are dissolved metals (boron, antimony, arsenic, chromium, lithium, molybdenum, selenium, nickel, vanadium) collected in accordance with the JH Campbell Dry Ash Landfill Hydrogeological Monitoring Plan (HMP).

Table 6
 Summary of Groundwater Protection Standard Exceedances – Second Quarter 2020
 JH Campbell Pond A – Assessment Monitoring Program
 West Olive, Michigan

Constituent	Units	GWPS	JHC-MW-15006		JHC-MW-15008R		JHC-MW-15009		JHC-MW-15010		JHC-MW-15011	
			LCL	UCL	LCL	UCL	LCL	UCL	LCL	UCL	LCL	UCL
Boron	ug/L	500	--	--	88	510	96	460	97	2,800	200	1,500
Sulfate	mg/L	250	27	260	--	--	--	--	--	--	--	--
TDS	mg/L	500	140	460	160	480	--	--	--	--	150	650
pH	SU	5.5 - 8.8	--	--	--	--	--	--	--	--	7.4	8.9
Arsenic	ug/L	10	--	--	--	--	--	--	--	--	16	38
Chromium	ug/L	100	--	--	--	--	--	--	0.5	370	--	--
Selenium	ug/L	50	--	--	1.7	110	0.73	51	2.3	150	1.0	100

Notes:

ug/L - micrograms per Liter

mg/L - milligrams per Liter

SU - standard units; pH is a field parameter.

-- - 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 Memoranda dated October 15, 2018 and December 23, 2019.

UCL - Upper Confidence Limit ($\alpha = 0.01$) of the downgradient data set.

LCL - Lower Confidence Limit ($\alpha = 0.01$) 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 7
 Summary of Groundwater Exceedances
 Second Quarter 2020
 JH Campbell Plant Pond A, West Olive, Michigan

MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY
 SUMMARY OF STATISTICAL EXCEEDANCES

Data is in (X) ug/L or () mg/L unless otherwise stated
--

Facility: JH Campbell – WDS# 395496

Well #	Location	Parameter	Part 201 GRCC	Statistical Limit (or 'CC' for Control Charts)	2 Qtr. 2020 (bold >201)	1 Qtr. 2020 (bold >201)	4 Qtr. 2019 (bold >201)	2 Qtr. 2019 (bold >201)
JHC-MW-15011	Downgradient	Arsenic	10	LCL	25	31	44⁽¹⁾	36⁽¹⁾

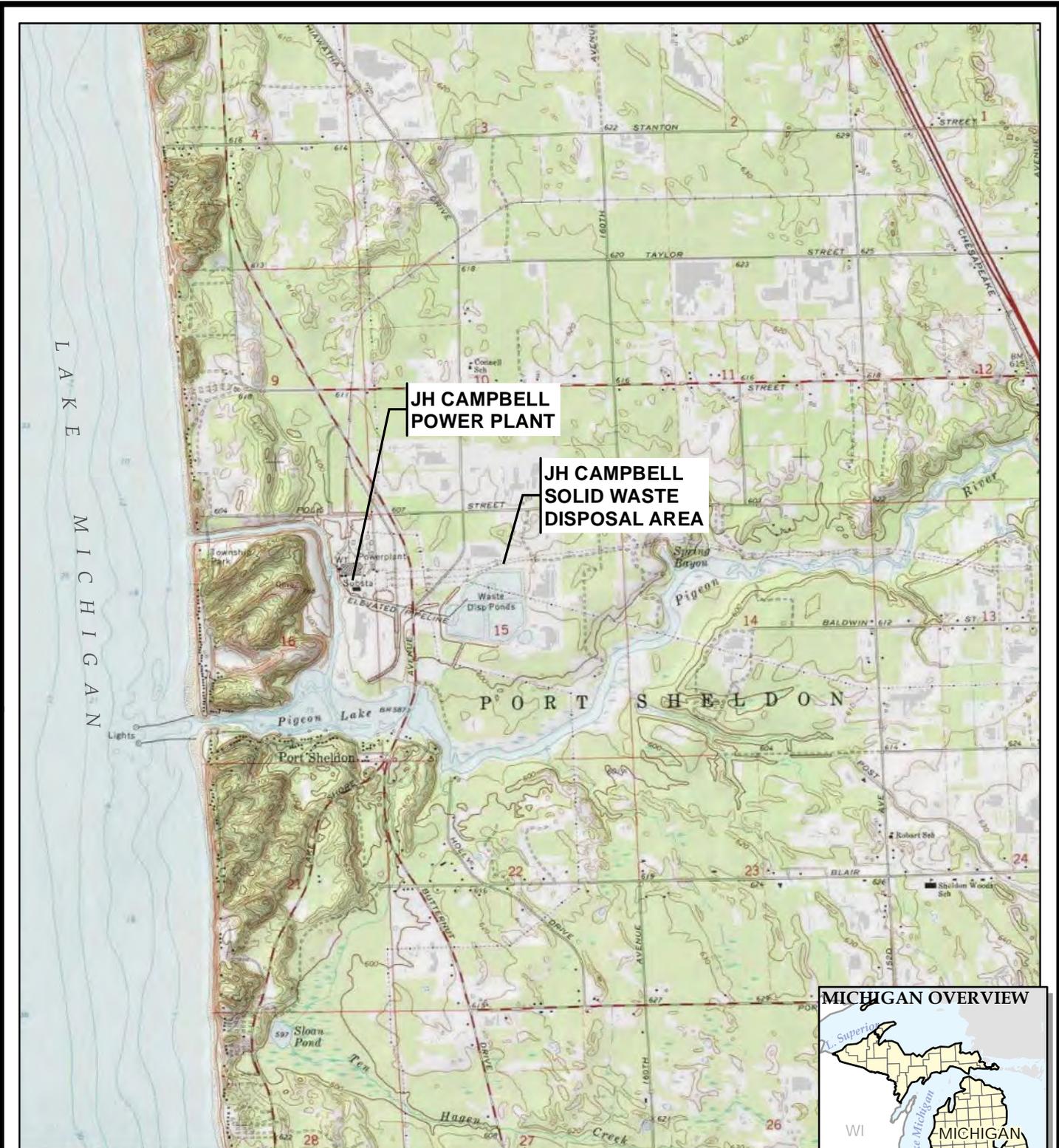
Notes:

Table summarizes statistically significant Groundwater Protection Standards (GWPSs) exceedances as determined using confidence intervals.

LCL - Lower confidence limit

(1) - Exceeded Part 201 Generic Residential Cleanup Criteria (GRCC) but did not result in a statistically significant GWPS exceedance.

Figures



BASE MAP FROM USGS 7.5 MINUTE TOPOGRAPHIC QUADRANGLE SERIES.



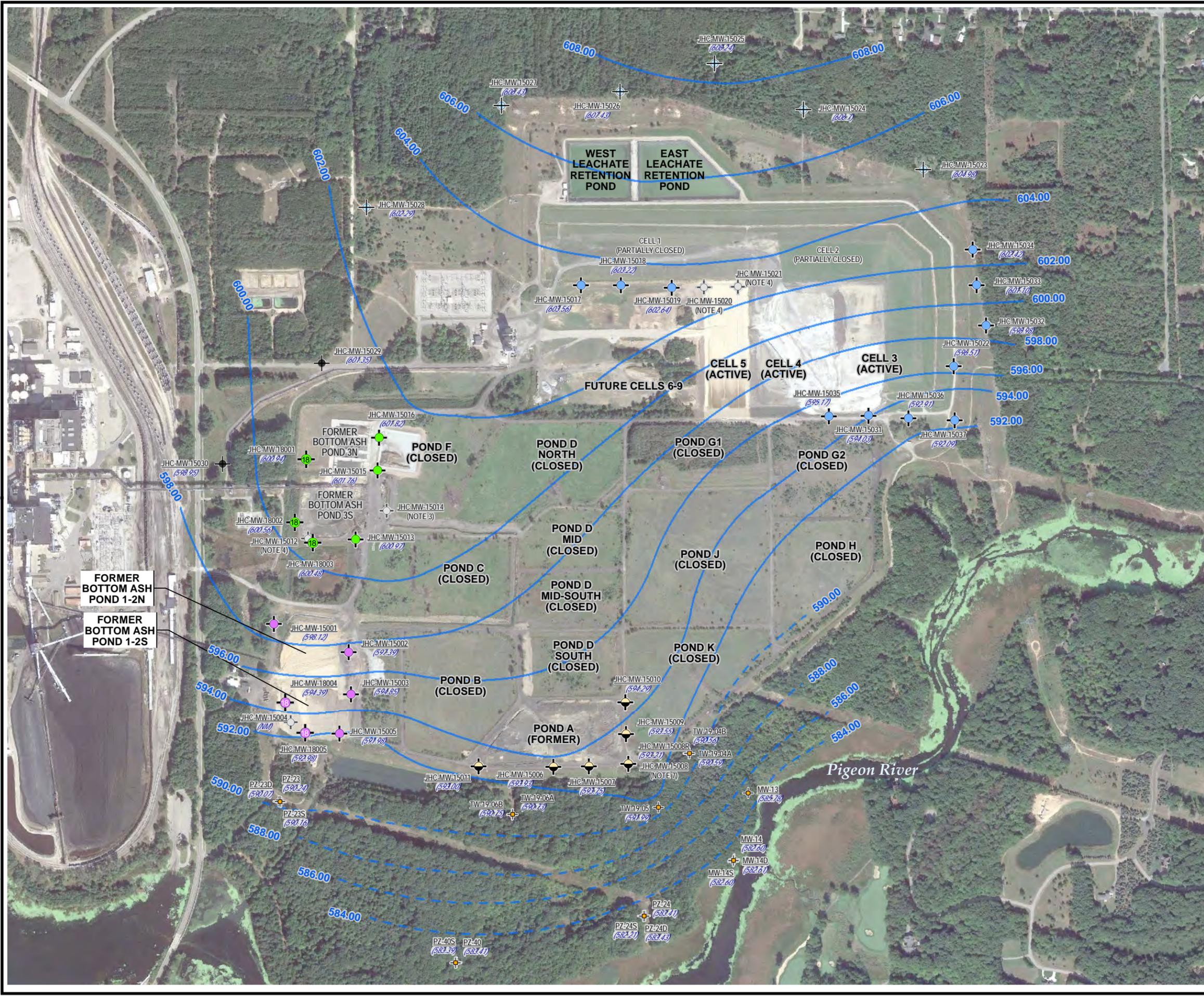
1540 Eisenhower Place
Ann Arbor, MI 48108-3284
Phone: 734.971.7080
www.trccompanies.com

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

TITLE:
SITE LOCATION MAP

DRAWN BY:	S. MAJOR
CHECKED BY:	B. YELEN
APPROVED BY:	S. HOLMSTROM
DATE:	JANUARY 2020
PROJ. NO.:	322174
FILE:	322174-001-022.mxd

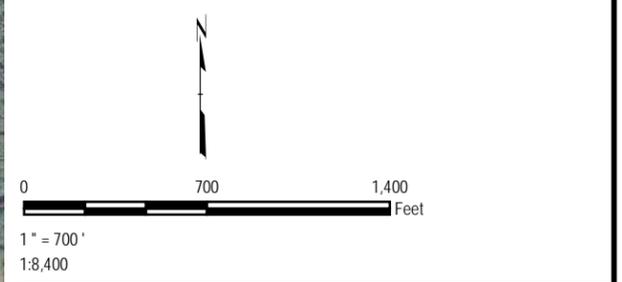
FIGURE 1



LEGEND

- BACKGROUND MONITORING WELL
- DOWNGRAIDENT BOTTOM ASH POND 1/2 N/S MONITORING WELL
- DOWNGRAIDENT BOTTOM ASH POND 3 N/S MONITORING WELL
- DOWNGRAIDENT LANDFILL MONITORING WELL
- DOWNGRAIDENT POND A MONITORING WELL
- MONITORING WELL (STATIC WATER LEVEL ONLY)
- DECOMMISSIONED MONITORING WELL
- NEW DOWNGRAIDENT BOTTOM ASH POND 1/2 N/S MONITORING WELL (2018)
- NEW DOWNGRAIDENT BOTTOM ASH POND 3 N/S MONITORING WELL (2018)
- NATURE AND EXTENT WELL
- GROUNDWATER ELEVATION CONTOUR (2' INTERVAL, DASHED WHERE INFERRED)
- (600.97) GROUNDWATER ELEVATION (FEET) SHALLOW WELLS
- (NM) NOT MEASURED

- ### NOTES
1. BASE MAP IMAGERY FROM GOOGLE EARTH PRO, 2018.
 2. WELL LOCATIONS BASED ON SURVEY DATA THROUGH 12/07/2018.
 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.



PROJECT:		CONSUMERS ENERGY COMPANY JH CAMPBELL POWER PLANT WEST OLIVE, MICHIGAN	
TITLE:		GROUNDWATER CONTOUR MAP APRIL 2020	
DRAWN BY:	S. MAJOR	PROJ NO.:	367390.0001.0000
CHECKED BY:	K. LOWERY	FIGURE 3	
APPROVED BY:	S. HOLMSTROM		
DATE:	JULY 2020		

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FILE NO.: 367390-001-003.mxd

Appendix A

Data Quality Review

Laboratory Data Quality Review Groundwater Monitoring Event April 2020 CEC JH Campbell Background Wells

Groundwater samples were collected by Consumers Energy (CE) Laboratory Services for the April 2020 sampling event. Samples were analyzed for metals, anions, and total dissolved solids (TDS) by CE Laboratory Services in Jackson, Missouri. The laboratory analytical results were reported in laboratory project number 20-0395.

During the April 2020 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 6020, SW-846 7470A

Note that results for an extended list of metals (magnesium, potassium, and sodium), ammonia, nitrate, nitrite, alkalinity, and sulfide were provided for samples JHC-MW-15024, JHC-MW-15025, and JHC-MW-15027 as supplemental monitoring in laboratory project number 20-0395 but were not evaluated or included in this review. Further, the evaluation of radium results for samples collected during the April 2020 sampling event will be included in a supplemental review once results are available.

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, 2017). 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 equipment blanks and field blanks. Field and equipment blanks are used to assess potential contamination arising from field procedures;

- 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 laboratory control samples were not provided for review by the laboratory. 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.

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 iron, copper, nickel, silver, vanadium, and zinc 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

- Preparation dates were not provided by the laboratory. Since the analyses were performed within the preparation holding times, where applicable, there is no impact on data usability due to this issue.
- The cooler temperatures were between 6.1 and 8.2 degrees Celsius and the laboratory noted that samples were not received on ice. Samples were not received by the laboratory on the same day as collection. Therefore, results for TDS and anions in all samples collected during this sampling event should be considered estimated and may be biased low as summarized in the attached table. However, results for TDS and anions are consistent with historical results. Therefore, data usability is not affected.
- One equipment blank (EB-03) and one field blank (FB-03) were collected. Target analytes were not detected in these blank samples.
- MS and MSD analyses were performed on sample JHC-MW-15025 for mercury, 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-03/JHC-MW-15023. All criteria were met.
- It is unknown if laboratory duplicate analyses were performed on a sample from this data set since the QC reported by the laboratory was incomplete.
- Undiluted laboratory RLs were at the project-specified RLs in the monitoring plan with the following exceptions/notes:
 - RLs for total boron (20 µg/L), chloride (1,000 µg/L), and TDS (10,000 µg/L) were lower than the monitoring plan RLs (50 µg/L, 2,000 µg/L, and 50,000 µg/L, respectively). Boron in JHC-MW-15023, JHC-MW-15024, JHC-MW-15025, and DUP-03, TDS in JHC-MW-15027, JHC-MW-15028, and DUP-03, and chloride in JHC-MW-15023 were affected by the lower RL since boron, chloride, and/or TDS were detected in these samples above the laboratory's RL and below the monitoring plan RL. RLs are consistent with the Michigan Department of Environment, Great Lakes, and Energy (EGLE) Op Memo WMRPD-115-14; therefore, data usability is not affected.
 - The RL for total barium (5 µg/L) in all samples was higher than the monitoring plan RL (1 µg/L). However, barium was detected in all samples except for the blanks (EB-03 and FB-03). The RL is consistent with the EGLE Op Memo; therefore, data usability is not affected.
 - The nondetect RL for total cobalt (15 µg/L) in all samples was higher than the monitoring plan RL (6 µg/L) and does not meet project needs.
 - The laboratory indicated in the case narrative that due to matrix interference/possible carry over effects, the RL for silver was increased to 0.3 µg/L for sample JHC-MW-15024; this RL does not meet the project-specified RL of 0.2 µg/L.

Attachment A

Summary of Data Non-Conformances for Landfill Groundwater Analytical Data
 JH Campbell Background Wells – RCRA CCR Monitoring Program
 West Olive, Michigan

Samples	Collection Date	Analyte	Non-Conformance/Issue
JHC-MW-15023	4/16/2020	TDS, Chloride, Fluoride, Sulfate	Samples not received on ice with elevated cooler temperature; sample results should be considered estimated and may be biased low. However, results were consistent with historical results; therefore, data usability is not affected.
JHC-MW-15024	4/16/2020		
JHC-MW-15025	4/16/2020		
JHC-MW-15026	4/16/2020		
JHC-MW-15027	4/16/2020		
JHC-MW-15028	4/16/2020		
EB-03	4/16/2020		
FB-03	4/16/2020		
DUP-03	4/16/2020		

Laboratory Data Quality Review Groundwater Monitoring Event April 2020 – Radium Consumers Energy JH Campbell Background Wells

Groundwater samples were collected by Consumers Energy (CE) Laboratory Services for the April 2020 sampling event. Samples were analyzed for radium; radium analyses were subcontracted to Eurofins TA in St. Louis, Missouri (Eurofins TA – St. Louis). The laboratory analytical results were reported in laboratory project number 160-37918-1.

During the April 2020 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 (Radium-226, Radium-228, Combined Radium)	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;
- 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;

- Percent recoveries for carriers. Carriers are used to assess the chemical yield for the preparation and/or instrument efficiency;
- 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 Appendix 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

- A method blank was analyzed with each analytical batch. Target analytes were not detected in the method blank samples.
- One equipment blank (EB-03) and one field blank (FB-03) were collected. Target analytes were not detected.
- The LCS and LCSD recoveries and relative percent differences (RPDs) were within QC limits with the following exceptions.
 - The recovery for radium-228 (24%) in the LCSD and the replicate error ratio (RER) in the LCS/LCSD analyses (3.46) performed with preparation batch 471099 were outside of the acceptance limits (75-125% and 1, respectively). The laboratory indicated that there was insufficient sample volume for re-preparation. There is no adverse impact on the data usability due to these issues since the recovery for radium-228 was acceptable in the LCS.
- MS and MSD analyses were not performed.
- The field duplicate pair samples were DUP-03/JHC-MW-15023; all criteria were met.
- Laboratory duplicate analyses were not performed.
- Carrier recoveries were within 40-110% with the following exceptions.
 - The barium carrier recoveries in the radium-228 analyses of samples JHC-MW-15025 (25.8%) and sample JHC-MW-15027 (34.7%) were below the acceptance criteria (40-110%). The laboratory indicated that there was physical evidence of matrix interference present during sample preparation; there was insufficient sample volume for re-

preparation. Therefore, the nondetect results for radium-228 in these samples should be considered estimated and biased low, as summarized in the attached table. However, the nondetect results were within or above the range of historical results. Therefore, data usability is not affected.

- Samples did not undergo a 21-day wait period prior to radium-226 analysis; however, combined radium results were < 5 pCi/L so there is no impact on data usability.
- The minimum detectable concentrations (MDCs) for radium-228 in samples JHC-MW-15025 (1.90 pCi/L) and sample JHC-MW-15027 (1.37 pCi/L) were above the project-specified limit of 1.00 pCi/L likely due to matrix interference; however, combined radium results were < 5 pCi/L so there is no adverse impact on data usability.

Attachment A
Summary of Data Non-Conformances
JH Campbell Background – RCRA CCR Monitoring Program
West Olive, Michigan

Samples	Collection Date	Analyte	Non-Conformance/Issue
JHC-MW-15025	4/16/2020	Radium 228	Low barium carrier recovery. Potential low bias exists for these nondetect results. However, results are within or above the range of historical results; therefore, data usability is not affected.
JHC-MW-15027	4/16/2020		

Laboratory Data Quality Review Groundwater Monitoring Event April 2020 CEC JH Campbell Pond A and Downgradient Wells

Groundwater samples were collected by Consumers Energy (CE) Laboratory Services for the April 2020 sampling event. Samples were analyzed for select total and/or dissolved metals, anions, and total dissolved solids by CE Laboratory Services in Jackson, Michigan. The laboratory analytical results were reported in laboratory project numbers 20-0384 and 20-0405.

During the April 2020 sampling event, a groundwater sample was collected from each of the following wells:

- JHC-MW-15006
- JHC-MW-15007
- JHC-MW-15008R
- JHC-MW-15009
- JHC-MW-15010
- JHC-MW-15011
- MW-14S
- PZ-24S
- PZ-40S

Well MW-13 was purged dry, so a sample was not collected for total metals.

Each sample was analyzed for one or more of the following constituents:

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

Note that results for an extended list of metals (magnesium, sodium, and potassium), ammonia, nitrate, nitrite, alkalinity, and sulfide were provided for sample JHC-MW-15011 as supplemental monitoring in laboratory project number 20-0384 but were not evaluated or included in this review. Further, the evaluation of radium results for samples collected during the April 2020 sampling event will be included in a supplemental review once results are available.

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 Data Review (USEPA, 2017). 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 equipment blanks and field blanks. Field and equipment blanks are used to assess potential contamination arising from field procedures;
- 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 laboratory control samples were not provided for review. 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 all parameters included in this review.

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 iron, copper, nickel, silver, vanadium, and zinc 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

- Preparation dates were not provided by CE Laboratory Services. Since the analyses were performed within the preparation holding times, where applicable, there is no impact on data usability due to this issue.
- One equipment blank (EB-02) and one field blank (FB-02) were collected. Target analytes were not detected in EB-02.
 - Zinc was detected at 13 µg/L in FB-02. There was no impact on data usability since zinc was not detected in the associated samples.
- MS and MSD analyses were performed on sample JHC-MW-15007 for mercury, 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-15009. All criteria were met.
- It is unknown if laboratory duplicate analyses were performed on a sample from this data set since the QC reported by the laboratory was incomplete.
- Undiluted laboratory RLs were at the project-specified RLs in the monitoring plan with the following exceptions/notes:
 - RLs for total boron (20 µg/L), chloride (1,000 µg/L), nickel (1 µg/L) and TDS (10,000 µg/L) were lower than the monitoring plan RLs (50 µg/L, 2,000 µg/L, 2 µg/L, and 50,000 µg/L, respectively). Boron in sample MW-14S and TDS in samples MW-14S, PZ-24S, and PZ-40S were affected by the lower RLs since boron and/or TDS were detected in these samples above the laboratory's RL and below the monitoring plan RL. RLs are consistent with the Michigan Department of Environment, Great Lakes, and Energy (EGLE) Op Memo WMRPD-115-14; therefore, data usability is not affected.
 - The RL for total barium (5 µg/L) in all samples was higher than the monitoring plan RL (1 µg/L). However, barium was detected in all samples except for the blanks (EB-03 and FB-03). The RL is consistent with the EGLE Op Memo; therefore, data usability is not affected.
 - The nondetect RL for total cobalt (15 µg/L) in all samples was higher than the monitoring plan RL (6 µg/L) and does not meet project needs.
 - The laboratory indicated in the case narrative that due to matrix interference/possible carry over effects, the RL for silver was increased to 0.4 µg/L for samples JHC-MW-15006 and JHC-MW-15011; this RL does not meet the project-specified RL of 0.2 µg/L.

Laboratory Data Quality Review Groundwater Monitoring Event April 2020 – Radium CEC JH Campbell Pond A Wells

Groundwater samples were collected by Consumers Energy (CE) Laboratory Services for the April 2020 sampling event. Samples were analyzed for radium; radium analyses were subcontracted to Eurofins TA in St. Louis, Missouri (Eurofins TA – St. Louis). The laboratory analytical results were reported in laboratory project numbers 160-37917-1.

During the April 2020 sampling event, a groundwater sample was collected from each of the following wells:

- JHC-MW-15006
- JHC-MW-15007
- JHC-MW-15008R
- JHC-MW-15009
- JHC-MW-15010
- JHC-MW-15011

Each sample was analyzed for the following constituents:

Analyte Group	Method
Radium (Radium-226, Radium-228, Combined Radium)	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;

- 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;
- Percent recoveries for carriers. Carriers are used to assess the chemical yield for the preparation and/or instrument efficiency;
- 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 Appendix 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

- A method blank was analyzed with each analytical batch. Target analytes were not detected in the method blank samples.
- One equipment blank (EB-02) and one field blank (FB-02) were collected. Target analytes were not detected.
- The LCS/LCSD recoveries and relative percent differences (RPDs) for all analytes were within QC limits.
- MS and MSD analyses were not performed.
- The field duplicate pair samples were DUP-02/JHC-MW-15009; RPDs between the parent and field duplicate samples were within the acceptance limits.
- Laboratory duplicate analyses were not performed.
- Carrier recoveries were within 40-110%.
- Samples did not undergo a 21-day wait period prior to radium-226 analysis; however, combined radium results were < 5 pCi/L so there is no impact on data usability.

Appendix B

April 2020 Assessment Monitoring Statistical Evaluation

Technical Memorandum

Date: July 21, 2020

To: Bethany Swanberg, Consumers Energy

From: Sarah Holmstrom, TRC
Kristin Lowery, TRC

Project No.: 367390.0000.0000 Phase 1 Task 4

Subject: Statistical Evaluation of April 2020 Assessment Monitoring Sampling Event, JH Campbell Pond A, Consumers Energy, West Olive, Michigan

Consumers Energy is conducting quarterly groundwater monitoring at Pond A in accordance with the Pond A HMP and AMP and semiannual monitoring in accordance with the CCR Rule per the JH Campbell Monitoring Program Sample Analysis Plan (SAP) (ARCADIS, May 2016). The second quarter 2020 monitoring event was conducted on April 13 through 16, 2020. In accordance with the Pond A AMP, the assessment monitoring data must be compared to GWPSs to determine whether or not Appendix III and Appendix IV constituents are detected at statistically significant levels above the GWPSs. Appendix IV 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 (TRC, January 2019) and Appendix III GWPSs were established in accordance with §257.95(h) and the HMP, as detailed in the December 23, 2019 Groundwater Protection Standards – Consumers Energy, JH Campbell Site, Pond A CCR Unit memorandum, which was also included in the 2019 Annual Groundwater Monitoring Report. The following narrative describes the methods that were employed for the comparisons to the GWPSs. The results obtained and the Sanitas™ output files are included as an attachment.

The statistical evaluation of the second quarter 2020 event data indicates that the following constituent is present at statistically significant levels exceeding the GWPS in downgradient monitoring wells at the JHC Pond A CCR Unit:

Constituent	GWPS	# Downgradient Wells Observed
Arsenic	10 ug/L	1 of 6

The results are consistent with the results of the previous assessment monitoring data statistical evaluations where arsenic at JHC-MW-15011 was the only constituent present at statistically significant levels above its GWPS.

Assessment Monitoring Statistical Evaluation

The downgradient compliance well network at the JHC Pond A consists of six wells (JHC-MW-15006 through JHC-MW-15011) located south and east of Pond A.

Technical Memorandum

The water table in the area of Pond A has continued to drop as groundwater equilibrates following cessation of hydraulic loading and placement of the cover at Pond A. As a result, the water table had dropped below the well screen at JHC-MW-15008 such that the monitoring well could no longer be used to collect groundwater samples. Monitoring well JHC-MW-15008 was decommissioned in June 2019 and replaced with JHC-MW-15008R. The replacement well was installed at a location adjacent to and side-gradient from the original well location and screened at a lower depth (across the water table) in order to monitor groundwater quality downgradient from Pond A. Monitoring well JHC-MW-15008R replaces JHC-MW-15008 in the Pond A assessment monitoring program and data from the replacement well is combined with data from the existing well for statistical evaluation.

Following the second quarter 2020 sampling event, compliance well data for JHC Pond A were evaluated in accordance with the Groundwater Statistical Evaluation Plan (Stats Plan) (TRC, October 2017) and the Pond A HMP and AMP. An assessment monitoring program was developed to evaluate concentrations of CCR constituents present in the uppermost aquifer relative to acceptable levels (i.e., GWPSs). To evaluate whether or not a new GWPS exceedance is statistically significant, the difference in concentration observed at the downgradient 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 Guidance¹, 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. Based on the number of historical observations in the representative sample population, the population mean, the population 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 and lower and upper confidence limits.

For constituents at monitoring wells that have no previously identified statistically significant GWPS exceedances, 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 GWPS². 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 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 III and Appendix IV constituent, the concentrations from each well were

¹ USEPA. 2009. *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, Unified Guidance*. Office of Conservation and Recovery. EPA 530/R-09-007

² For pH, an exceedance occurs when the lower confidence level exceeds the upper GWPS or the upper confidence level is below the lower GWPS.

Technical Memorandum

first compared directly to the GWPS, as shown on Table B1. Constituent-well combinations that included a direct exceedance of the GWPS within the past eight monitoring events (August 2017 to April 2020 for JHC-MW-15006, JHC-MW-15010, and JHC-MW-15011 and June 2017 to April 2020 for JHC-MW-15007, JHC-MW-15008/R, and JHC-MW-15009) were retained for further analysis (Attachment 1). Direct comparison GWPS exceedances include the following constituent well combinations:

- Sulfate and total dissolved solids (TDS) in JHC-MW-15006,
- Boron, TDS, and selenium in JHC-MW-15008/R,
- Boron and selenium in JHC-MW-15009,
- Boron, chromium, and selenium in JHC-MW-15010, and
- Boron, TDS, pH, arsenic, and selenium in JHC-MW-15011.

Groundwater data were then evaluated utilizing Sanitas™ statistical software. Sanitas™ is a software tool that is commercially available for performing statistical evaluations 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 and non-parametric confidence intervals were calculated, as appropriate, for each of the CCR Appendix III or Appendix IV constituents using a 99 percent confidence level for each individual statistical test, i.e., a significance level (α) of 0.01. The following narrative describes the methods employed, the results obtained and 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.

Initially, the baseline (December 2015 through August 2017) results and the assessment monitoring results (April 2018 through April 2020) were observed visually for potential trends and outliers (time-series plots in Attachment 1). Potential increasing trends were noted for boron in JHC-MW-15008/R, JHC-MW-15009, and JHC-MW-15011, sulfate in JHC-MW-15006, TDS in JHC-MW-15008/R and JHC-MW-15011, and selenium in JHC-MW-15009 and JHC-MW-15010 (trend tests in Attachment 1). Groundwater conditions are re-equilibrating following capping activities at JHC Pond A that were completed in Summer 2019. Because hydrogeologic conditions are in the process of stabilizing, temporary trending and sporadic outlier data are not unexpected.

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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 an 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 $\alpha = 0.01$. The software outputs are included in Attachment 1 along with data reports showing the values used for the evaluation. The percentage of non-detect observations are also included in Attachment 1. Non-detect data were 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. The data distributions are as follows:

Distribution	Constituent-Well Combinations
Normal	pH in JHC-MW-15011 Arsenic in JHC-MW-15011
Normalized by natural log transformation	Boron in JHC-MW-15009 and JHC-MW-15011
Normalized by square root transformation	TDS in JHC-MW-15006 and JHC-MW-15008/R Selenium in JHC-MW-15009 and JHC-MW-15010
Non-Parametric (not able to be normalized)	Boron in JHC-MW-15008/R and JHC-MW-15010 Sulfate in JHC-MW-15006 TDS in JHC-MW-15011 Chromium in JHC-MW-15010 Selenium in JHC-MW-15008/R and JHC-MW-15011

Arsenic was identified at downgradient monitoring well JHC-MW-15011 at statistically significant levels exceeding the GWPS during the initial assessment monitoring event conducted in June 2018. As shown in Table B1 and Attachment 1, arsenic concentrations at monitoring well JHC-MW-15011 showed a general increase in 2018 and 2019. Arsenic concentrations in this well have begun to decline in 2020 but remain above the GWPS. Consumers Energy will continue to monitor changes in groundwater chemistry and the assessment of corrective measures per the Pond A HMP and AMP and §257.95(g).

Attachments

Table B1	Comparison of Groundwater Sampling Results to Groundwater Protection Standards – June 2017 to April 2020
Attachment 1	Sanitas™ Output

Table

Table B1
 Comparison of Groundwater Sampling Results to Groundwater Protection Standards – June 2017 to April 2020
 JH Campbell Pond A – HMP/AMP
 West Olive, Michigan

Sample Location:									JHC-MW-15006									
Sample Date:									8/15/2017	9/26/2017	4/25/2018	6/20/2018	6/20/2018	11/15/2018	4/24/2019	10/10/2019	2/12/2020	4/14/2020
Constituent	Unit	EPA MCL	EPA RSL	MI Residential*	MI Non-Residential*	MI GSI^	UTL	GWPS					Field Dup					
Appendix III																		
Boron	ug/L	NC	NA	500	500	7,200	54	500	151	119	--	144	147	203	240	230	247	284
Calcium	mg/L	NC	NA	NC	NC	500	40	500	40.0	32.8	--	38.5	38.6	26.8	41	35	101	102
Chloride	mg/L	250**	NA	250	250	500	70	250	18.4	17.7	--	17.2	17.2	24.8	21	22	21.0	24.9
Fluoride	ug/L	4,000	NA	NC	NC	NC	1,000	4,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	250**	NA	250	250	500	13	250	28.9	31.1	--	27.5	27.5	27.0	75	55	217	260
Total Dissolved Solids	mg/L	500**	NA	500	500	500	240	500	206	172	--	376	268	140	240	190	542	562
pH, Field	SU	6.5 - 8.5**	NA	6.5 - 8.5	6.5 - 8.5	6.5 - 9.0	5.5 - 8.8	5.5 - 8.8	7.5	7.4	8.0	7.4	--	7.8	7.6	7.8	7.6	7.2
Appendix IV																		
Antimony	ug/L	6	NA	6.0	6.0	130	2	6	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Arsenic	ug/L	10	NA	10	10	10	1	10	8.5	--	4.8	4.3	4.7	4.7	5.1	4.3	6	5
Barium	ug/L	2,000	NA	2,000	2,000	820	35	2,000	220	--	158	141	146	144	230	180	326	353
Beryllium	ug/L	4	NA	4.0	4.0	18	1	4	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Cadmium	ug/L	5	NA	5.0	5.0	3.5	0.2	5	< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Chromium	ug/L	100	NA	100	100	11	2	100	2.0	--	1.5	1.5	1.8	2.3	4.1	< 1.0	2	1
Cobalt	ug/L	NC	6	40	100	100	15	15	< 15.0	--	< 15.0	< 15.0	< 15.0	< 6.0	< 6.0	< 6.0	< 6.0	< 15
Fluoride	ug/L	4,000	NA	NC	NC	NC	1,000	4,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	15	4.0	4.0	39	1	15	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Lithium	ug/L	NC	40	170	350	0.20#	10	40	16	--	13	12	12	13	< 10	< 10	13	13
Mercury	ug/L	2	NA	2.0	2.0	0.2	0.2	2	< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Molybdenum	ug/L	NC	100	73	210	3,200	5	100	5.9	--	< 5.0	5.4	5.5	12.2	10	9.1	13	16
Radium-226	pCi/L	NC	NA	NC	NC	NC	NA	NA	< 0.807	--	< 0.896	< 0.540	< 0.483	< 0.740	0.234	0.310	--	0.426
Radium-228	pCi/L	NC	NA	NC	NC	NC	NA	NA	< 0.881	--	< 0.779	< 0.963	< 0.944	< 0.588	< 0.343	< 0.524	--	0.518
Radium-226/228	pCi/L	5	NA	NC	NC	NC	1.93	5	< 1.69	--	< 1.68	< 1.50	< 1.43	< 1.33	0.488	< 0.524	--	0.944
Selenium	ug/L	50	NA	50	50	5.0	5	50	< 1.0	--	1.3	< 1.0	< 1.0	< 1.0	< 1.0	1.3	8	9
Thallium	ug/L	2	NA	2.0	2.0	3.7	2	2	< 2.0	--	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0

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.
- NC - no criteria.
- - not analyzed.
- MCL - Maximum Contaminant Level, EPA Drinking Water Standards and Health Advisories, April 2012.
- RSL - Regional Screening Level from 83 FR 36435.
- UTL - Upper Tolerance Limit (95%) of the background data set.
- GWPS - Groundwater Protection Standard. Appendix IV GWPS is the higher of the MCL/RSL and UTL as established in TRC's Technical Memorandum dated October 15, 2018. Appendix III GWPS is the most restrictive of the MCL/Part 201 criteria, or the UTL if the UTL exceeds the applicable criteria as established in TRC's Technical Memorandum dated December 23, 2019.
- * - Michigan Part 201 Generic Drinking Water Cleanup Criteria, December 30, 2013.
- ** - 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 EGLE policy and procedure 09-014 dated June 20, 2012.
- 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.
- (1) pH value potentially biased high due to groundwater quality meter malfunction.
- (2) Not sampled; insufficient amount of groundwater present to collect sample.
- (3) JHC-MW-15008 was decommissioned on June 24, 2019. Replacement well JHC-MW-15008R was installed on June 25, 2019.

Table B1
 Comparison of Groundwater Sampling Results to Groundwater Protection Standards – June 2017 to April 2020
 JH Campbell Pond A – HMP/AMP
 West Olive, Michigan

Sample Location:									JHC-MW-15007									
Sample Date:									6/21/2017	8/15/2017	9/26/2017	4/26/2018	6/20/2018	11/15/2018	4/24/2019	10/9/2019 ⁽²⁾	2/12/2020	4/14/2020
Constituent	Unit	EPA MCL	EPA RSL	MI Residential*	MI Non-Residential*	MI GSI [^]	UTL	GWPS	Downgradient									
Appendix III																		
Boron	ug/L	NC	NA	500	500	7,200	54	500	153	141	98	--	157	142	190	--	147	242
Calcium	mg/L	NC	NA	NC	NC	500	40	500	42.4	32.1	32.2	--	38.7	42.6	79	--	55.2	62.1
Chloride	mg/L	250**	NA	250	250	500	70	250	20.1	17.5	17.3	--	17.5	20.6	23	--	9.10	14.1
Fluoride	ug/L	4,000	NA	NC	NC	NC	1,000	4,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	--	< 1,000	< 1,000
Sulfate	mg/L	250**	NA	250	250	500	13	250	29.1	31.6	32.3	--	26.2	19.2	54	--	31.9	83
Total Dissolved Solids	mg/L	500**	NA	500	500	500	240	500	202	170	188	--	298	166	360	--	312	336
pH, Field	SU	6.5 - 8.5**	NA	6.5 - 8.5	6.5 - 8.5	6.5 - 9.0	5.5 - 8.8	5.5 - 8.8	7.3	7.4	7.3	8.4 ⁽¹⁾	7.4	7.6	7.4	--	7.4	7.0
Appendix IV																		
Antimony	ug/L	6	NA	6.0	6.0	130	2	6	< 1.0	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	--	< 1	< 1
Arsenic	ug/L	10	NA	10	10	10	1	10	3.2	4.0	--	3.3	2.9	4.0	4.0	--	3	3
Barium	ug/L	2,000	NA	2,000	2,000	820	35	2,000	143	130	--	121	115	177	320	--	231	266
Beryllium	ug/L	4	NA	4.0	4.0	18	1	4	< 1.0	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	--	< 1	< 1
Cadmium	ug/L	5	NA	5.0	5.0	3.5	0.2	5	< 0.20	< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20	--	< 0.2	< 0.2
Chromium	ug/L	100	NA	100	100	11	2	100	1.2	1.1	--	< 1.0	1.2	31.3	35	--	3	2
Cobalt	ug/L	NC	6	40	100	100	15	15	< 15.0	< 15.0	--	< 15.0	< 15.0	< 6.0	< 6.0	--	< 6	< 15
Fluoride	ug/L	4,000	NA	NC	NC	NC	1,000	4,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	--	< 1,000	< 1,000
Lead	ug/L	NC	15	4.0	4.0	39	1	15	< 1.0	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	--	< 1	< 1
Lithium	ug/L	NC	40	170	350	0.20#	10	40	14	16	--	11	15	16	12	--	15	14
Mercury	ug/L	2	NA	2.0	2.0	0.2	0.2	2	< 0.20	< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20	--	< 0.2	< 0.2
Molybdenum	ug/L	NC	100	73	210	3,200	5	100	6.1	6.1	--	< 5.0	< 5.0	7.6	7.2	--	< 5	< 5
Radium-226	pCi/L	NC	NA	NC	NC	NC	NA	NA	< 0.427	< 0.430	--	< 1.03	< 0.736	0.864	0.217	--	--	0.197
Radium-228	pCi/L	NC	NA	NC	NC	NC	NA	NA	< 1.15	< 0.904	--	< 1.02	< 1.12	< 0.688	0.392	--	--	< 0.456
Radium-226/228	pCi/L	5	NA	NC	NC	NC	1.93	5	< 1.58	< 1.33	--	< 2.05	< 1.86	1.40	0.609	--	--	< 0.456
Selenium	ug/L	50	NA	50	50	5.0	5	50	2.2	1.1	--	< 1.0	1.3	< 1.0	4.1	--	23	22
Thallium	ug/L	2	NA	2.0	2.0	3.7	2	2	< 2.0	< 2.0	--	< 2.0	< 2.0	< 2.0	< 2.0	--	< 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.
- NC - no criteria.
- - not analyzed.
- MCL - Maximum Contaminant Level, EPA Drinking Water Standards and Health Advisories, April 2012.
- RSL - Regional Screening Level from 83 FR 36435.
- UTL - Upper Tolerance Limit (95%) of the background data set.
- GWPS - Groundwater Protection Standard. Appendix IV GWPS is the higher of the MCL/RSL and UTL as established in TRC's Technical Memorandum dated October 15, 2018. Appendix III GWPS is the most restrictive of the MCL/Part 201 criteria, or the UTL if the UTL exceeds the applicable criteria as established in TRC's Technical Memorandum dated December 23, 2019.
- * - Michigan Part 201 Generic Drinking Water Cleanup Criteria, December 30, 2013.
- ** - 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 EGLE policy and procedure 09-014 dated June 20, 2012.
- 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.
- (1) pH value potentially biased high due to groundwater quality meter malfunction.
- (2) Not sampled; insufficient amount of groundwater present to collect sample.
- (3) JHC-MW-15008 was decommissioned on June 24, 2019. Replacement well JHC-MW-15008R was installed on June 25, 2019.

Table B1
 Comparison of Groundwater Sampling Results to Groundwater Protection Standards – June 2017 to April 2020
 JH Campbell Pond A – HMP/AMP
 West Olive, Michigan

Sample Location:									JHC-MW-15008 ⁽³⁾						JHC-MW-15008R ⁽³⁾					
Sample Date:									6/21/2017	8/15/2017	9/26/2017	4/26/2018	6/20/2018	11/15/2018 ⁽²⁾	4/24/2019 ⁽²⁾	8/13/2019	10/9/2019	10/9/2019	2/12/2020	4/14/2020
Constituent	Unit	EPA MCL	EPA RSL	MI Residential*	MI Non-Residential*	MI GSI [^]	UTL	GWPS	Downgradient											
Appendix III																				
Boron	ug/L	NC	NA	500	500	7,200	54	500	128	153	116	--	87.7	--	--	93	130	130	423	505
Calcium	mg/L	NC	NA	NC	NC	500	40	500	42.5	47.1	37.5	--	39	--	--	33	100	100	94.7	99.9
Chloride	mg/L	250**	NA	250	250	500	70	250	24.0	22.3	16.6	--	20.4	--	--	2.2	16	16	22.4	25.0
Fluoride	ug/L	4,000	NA	NC	NC	NC	1,000	4,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	--	--	170	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	250**	NA	250	250	500	13	250	29.8	31.8	28.4	--	25.5	--	--	20	220	220	219	235
Total Dissolved Solids	mg/L	500**	NA	500	500	500	240	500	260	340	190	--	210	--	--	150	< 50	430	556	566
pH, Field	SU	6.5 - 8.5**	NA	6.5 - 8.5	6.5 - 8.5	6.5 - 9.0	5.5 - 8.8	5.5 - 8.8	7.1	7.1	7.1	7.9 ⁽¹⁾	7.2	--	--	7.4	7.3	--	7.3	6.9
Appendix IV																				
Antimony	ug/L	6	NA	6.0	6.0	130	2	6	< 1.0	1.1	--	1.1	< 1.0	--	--	1.2	< 1.0	< 1.0	< 1	1
Arsenic	ug/L	10	NA	10	10	10	1	10	< 1.0	< 1.0	--	< 1.0	< 1.0	--	--	< 1.0	< 1.0	< 1.0	< 1	< 1
Barium	ug/L	2,000	NA	2,000	2,000	820	35	2,000	124	186	--	118	120	--	--	110	340	320	291	252
Beryllium	ug/L	4	NA	4.0	4.0	18	1	4	< 1.0	< 1.0	--	< 1.0	< 1.0	--	--	< 1.0	< 1.0	< 1.0	< 1	< 1
Cadmium	ug/L	5	NA	5.0	5.0	3.5	0.2	5	< 0.20	< 0.20	--	< 0.20	< 0.20	--	--	< 0.20	< 0.20	< 0.20	< 0.2	< 0.2
Chromium	ug/L	100	NA	100	100	11	2	100	7.8	5.4	--	1.3	1.5	--	--	3.8	4.5	4.5	7	< 1
Cobalt	ug/L	NC	6	40	100	100	15	15	< 15.0	< 15.0	--	< 15.0	< 15.0	--	--	< 6.0	< 6.0	< 6.0	< 6	< 15
Fluoride	ug/L	4,000	NA	NC	NC	NC	1,000	4,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	--	--	170	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	15	4.0	4.0	39	1	15	< 1.0	< 1.0	--	< 1.0	< 1.0	--	--	< 1.0	< 1.0	< 1.0	< 1	< 1
Lithium	ug/L	NC	40	170	350	0.20#	10	40	13	18	--	14	15	--	--	10	15	15	18	19
Mercury	ug/L	2	NA	2.0	2.0	0.2	0.2	2	< 0.20	< 0.20	--	< 0.20	< 0.20	--	--	< 0.20	< 0.20	< 0.20	< 0.2	< 0.2
Molybdenum	ug/L	NC	100	73	210	3,200	5	100	9.4	8.6	--	5.8	5.1	--	--	6.8	< 5.0	< 5.0	< 5	< 5
Radium-226	pCi/L	NC	NA	NC	NC	NC	NA	NA	< 0.599	< 0.437	--	< 0.493	0.928	--	--	0.183	0.449	0.751	--	0.180
Radium-228	pCi/L	NC	NA	NC	NC	NC	NA	NA	< 0.892	< 1.06	--	< 0.847	< 0.698	--	--	0.468	0.817	0.744	--	< 0.429
Radium-226/228	pCi/L	5	NA	NC	NC	NC	1.93	5	< 1.49	< 1.50	--	< 1.34	1.56	--	--	0.651	1.27	1.49	--	0.549
Selenium	ug/L	50	NA	50	50	5.0	5	50	2.3	2.4	--	1.7	2.0	--	--	12	110	110	11	6
Thallium	ug/L	2	NA	2.0	2.0	3.7	2	2	< 2.0	< 2.0	--	< 2.0	< 2.0	--	--	< 2.0	< 2.0	< 2.0	< 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.
- NC - no criteria.
- - not analyzed.
- MCL - Maximum Contaminant Level, EPA Drinking Water Standards and Health Advisories, April 2012.
- RSL - Regional Screening Level from 83 FR 36435.
- UTL - Upper Tolerance Limit (95%) of the background data set.
- GWPS - Groundwater Protection Standard. Appendix IV GWPS is the higher of the MCL/RSL and UTL as established in TRC's Technical Memorandum dated October 15, 2018. Appendix III GWPS is the most restrictive of the MCL/Part 201 criteria, or the UTL if the UTL exceeds the applicable criteria as established in TRC's Technical Memorandum dated December 23, 2019.
- * - Michigan Part 201 Generic Drinking Water Cleanup Criteria, December 30, 2013.
- ** - 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 EGLE policy and procedure 09-014 dated June 20, 2012.
- 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.
- (1) pH value potentially biased high due to groundwater quality meter malfunction.
- (2) Not sampled; insufficient amount of groundwater present to collect sample.
- (3) JHC-MW-15008 was decommissioned on June 24, 2019. Replacement well JHC-MW-15008R was installed on June 25, 2019.

Table B1
 Comparison of Groundwater Sampling Results to Groundwater Protection Standards – June 2017 to April 2020
 JH Campbell Pond A – HMP/AMP
 West Olive, Michigan

Sample Location:									JHC-MW-15009													
Sample Date:									6/21/2017	8/15/2017	9/26/2017	4/26/2018	4/26/2018	6/20/2018	11/15/2018	11/15/2018	4/24/2019	4/24/2019	10/9/2019 ⁽²⁾	2/12/2020	4/14/2020	4/14/2020
Constituent	Unit	EPA MCL	EPA RSL	MI Residential*	MI Non-Residential*	MI GSI [^]	UTL	GWPS					Field Dup			Field Dup		Field Dup				
Appendix III																						
Boron	ug/L	NC	NA	500	500	7,200	54	500	126	156	144	--	--	91.4	188	187	200	190	--	468	874	881
Calcium	mg/L	NC	NA	NC	NC	500	40	500	40.1	41.2	34.3	--	--	41.2	46.2	46.4	92	89	--	74.5	78.7	79.9
Chloride	mg/L	250**	NA	250	250	500	70	250	23.8	20.1	17.7	--	--	22.9	17.7	17.7	17	16	--	10.7	6.95	6.78
Fluoride	ug/L	4,000	NA	NC	NC	NC	1,000	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
Sulfate	mg/L	250**	NA	250	250	500	13	250	28.6	31.6	32.7	--	--	18.2	26.9	27.1	130	130	--	40.5	49.1	49.9
Total Dissolved Solids	mg/L	500**	NA	500	500	500	240	500	188	208	178	--	--	214	234	202	430	440	--	332	354	341
pH, Field	SU	6.5 - 8.5**	NA	6.5 - 8.5	6.5 - 8.5	6.5 - 9.0	5.5 - 8.8	5.5 - 8.8	7.4	7.5	7.4	8.4 ⁽¹⁾	--	7.7	7.6	--	7.4	--	--	7.5	7.2	--
Appendix IV																						
Antimony	ug/L	6	NA	6.0	6.0	130	2	6	1.1	< 1.0	--	< 1.0	< 1.0	< 1.0	1.2	< 1.0	< 1.0	< 1.0	--	< 1	1	1
Arsenic	ug/L	10	NA	10	10	10	1	10	< 1.0	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	--	< 1	< 1	< 1
Barium	ug/L	2,000	NA	2,000	2,000	820	35	2,000	132	198	--	130	125	130	178	181	360	360	--	287	307	298
Beryllium	ug/L	4	NA	4.0	4.0	18	1	4	< 1.0	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	--	< 1	< 1	< 1
Cadmium	ug/L	5	NA	5.0	5.0	3.5	0.2	5	< 0.20	< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	--	< 0.2	< 0.2	< 0.2
Chromium	ug/L	100	NA	100	100	11	2	100	5	6.6	--	1.3	1.3	< 1.0	14.1	11.8	17	14	--	31	1	1
Cobalt	ug/L	NC	6	40	100	100	15	15	< 15.0	< 15.0	--	< 15.0	< 15.0	< 15.0	< 6.0	< 6.0	< 6.0	< 6.0	--	< 6	< 15	< 15
Fluoride	ug/L	4,000	NA	NC	NC	NC	1,000	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
Lead	ug/L	NC	15	4.0	4.0	39	1	15	< 1.0	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	--	< 1	< 1	< 1
Lithium	ug/L	NC	40	170	350	0.20#	10	40	11	11	--	< 10	< 10	< 10	14	14	11	11	--	14	14	14
Mercury	ug/L	2	NA	2.0	2.0	0.2	0.2	2	< 0.20	< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	--	< 0.2	< 0.2	< 0.2
Molybdenum	ug/L	NC	100	73	210	3,200	5	100	22.3	7.4	--	5.5	5.5	< 5.0	6.1	6.1	5.7	5.6	--	15	< 5	< 5
Radium-226	pCi/L	NC	NA	NC	NC	NC	NA	NA	0.553	< 0.455	--	< 0.169	< 0.709	< 0.631	< 0.896	< 0.705	0.351	0.289	--	--	0.394	0.307
Radium-228	pCi/L	NC	NA	NC	NC	NC	NA	NA	< 1.08	1.04	--	< 1.26	< 1.14	< 0.634	0.800	< 0.663	0.674	0.509	--	--	0.573	0.459
Radium-226/228	pCi/L	5	NA	NC	NC	NC	1.93	5	< 1.23	< 1.40	--	< 1.43	< 1.85	< 1.27	< 1.47	< 1.37	1.02	0.798	--	--	0.967	0.767
Selenium	ug/L	50	NA	50	50	5.0	5	50	4.7	< 1.0	--	< 1.0	1.0	10.3	12.6	12.6	61	63	--	20	77	79
Thallium	ug/L	2	NA	2.0	2.0	3.7	2	2	< 2.0	< 2.0	--	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	--	< 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.
 NC - no criteria.
 -- - not analyzed.
 MCL - Maximum Contaminant Level, EPA Drinking Water Standards and Health Advisories, April 2012.
 RSL - Regional Screening Level from 83 FR 36435.
 UTL - Upper Tolerance Limit (95%) of the background data set.
 GWPS - Groundwater Protection Standard. Appendix IV GWPS is the higher of the MCL/RSL and UTL as established in TRC's Technical Memorandum dated October 15, 2018. Appendix III GWPS is the most restrictive of the MCL/Part 201 criteria, or the UTL if the UTL exceeds the applicable criteria as established in TRC's Technical Memorandum dated December 23, 2019.
 * - Michigan Part 201 Generic Drinking Water Cleanup Criteria, December 30, 2013.
 ** - 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 EGLE policy and procedure 09-014 dated June 20, 2012.
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.
 (1) pH value potentially biased high due to groundwater quality meter malfunction.
 (2) Not sampled; insufficient amount of groundwater present to collect sample.
 (3) JHC-MW-15008 was decommissioned on June 24, 2019. Replacement well JHC-MW-15008R was installed on June 25, 2019.

Table B1
 Comparison of Groundwater Sampling Results to Groundwater Protection Standards – June 2017 to April 2020
 JH Campbell Pond A – HMP/AMP
 West Olive, Michigan

Sample Location:									JHC-MW-15010											
Sample Date:									8/15/2017	9/26/2017	4/26/2018	6/20/2018	11/14/2018	4/23/2019	10/9/2019	2/11/2020	2/11/2020	4/14/2020		
Constituent	Unit	EPA MCL	EPA RSL	MI Residential*	MI Non-Residential*	MI GSI [^]	UTL	GWPS	Downgradient											
Appendix III																				Field Dup
Boron	ug/L	NC	NA	500	500	7,200	54	500	164	109	--	98.4	120	2,800	2,800	2,390	2,390	2,350		
Calcium	mg/L	NC	NA	NC	NC	500	40	500	39.4	33.0	--	40.9	59.6	58	84	82.9	88.0	82.7		
Chloride	mg/L	250**	NA	250	250	500	70	250	19.1	17.8	--	22.2	7.9	2.0	< 2.0	2.59	2.61	3.20		
Fluoride	ug/L	4,000	NA	NC	NC	NC	1,000	4,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000		
Sulfate	mg/L	250**	NA	250	250	500	13	250	37.0	32.6	--	39.9	33.3	24	32	30.7	31.2	35.9		
Total Dissolved Solids	mg/L	500**	NA	500	500	500	240	500	338	220	--	294	262	270	330	280	319	333		
pH, Field	SU	6.5 - 8.5**	NA	6.5 - 8.5	6.5 - 8.5	6.5 - 9.0	5.5 - 8.8	5.5 - 8.8	7.3	7.2	8.0 ⁽¹⁾	7.3	7.5	6.6	6.9	7.0	--	6.6		
Appendix IV																				
Antimony	ug/L	6	NA	6.0	6.0	130	2	6	1.5	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1		
Arsenic	ug/L	10	NA	10	10	10	1	10	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1		
Barium	ug/L	2,000	NA	2,000	2,000	820	35	2,000	179	--	137	122	211	250	270	266	267	276		
Beryllium	ug/L	4	NA	4.0	4.0	18	1	4	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1		
Cadmium	ug/L	5	NA	5.0	5.0	3.5	0.2	5	< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.2	< 0.2	< 0.2		
Chromium	ug/L	100	NA	100	100	11	2	100	< 1.0	--	1.4	1.1	1.5	1.2	370	4	5	1		
Cobalt	ug/L	NC	6	40	100	100	15	15	< 15.0	--	< 15.0	< 15.0	< 6.0	< 6.0	< 6.0	< 6	< 6	< 15		
Fluoride	ug/L	4,000	NA	NC	NC	NC	1,000	4,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000		
Lead	ug/L	NC	15	4.0	4.0	39	1	15	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1		
Lithium	ug/L	NC	40	170	350	0.20#	10	40	12	--	10	< 10	12	13	17	20	20	20		
Mercury	ug/L	2	NA	2.0	2.0	0.2	0.2	2	< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.2	< 0.2	< 0.2		
Molybdenum	ug/L	NC	100	73	210	3,200	5	100	13.2	--	11.0	7.6	5.0	< 5.0	14	< 5	< 5	< 5		
Radium-226	pCi/L	NC	NA	NC	NC	NC	NA	NA	0.745	--	0.505	< 0.489	< 0.858	0.198	0.643	--	--	0.27		
Radium-228	pCi/L	NC	NA	NC	NC	NC	NA	NA	< 0.808	--	< 1.03	< 0.655	0.814	< 0.326	1.12	--	--	0.752		
Radium-226/228	pCi/L	5	NA	NC	NC	NC	1.93	5	1.36	--	< 1.20	< 1.14	< 1.43	0.515	1.76	--	--	1.02		
Selenium	ug/L	50	NA	50	50	5.0	5	50	< 1.0	--	3.0	11.0	34.1	32	210	126	126	158		
Thallium	ug/L	2	NA	2.0	2.0	3.7	2	2	< 2.0	--	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 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.
- NC - no criteria.
- - not analyzed.
- MCL - Maximum Contaminant Level, EPA Drinking Water Standards and Health Advisories, April 2012.
- RSL - Regional Screening Level from 83 FR 36435.
- UTL - Upper Tolerance Limit (95%) of the background data set.
- GWPS - Groundwater Protection Standard. Appendix IV GWPS is the higher of the MCL/RSL and UTL as established in TRC's Technical Memorandum dated October 15, 2018. Appendix III GWPS is the most restrictive of the MCL/Part 201 criteria, or the UTL if the UTL exceeds the applicable criteria as established in TRC's Technical Memorandum dated December 23, 2019.
- * - Michigan Part 201 Generic Drinking Water Cleanup Criteria, December 30, 2013.
- ** - 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 EGLE policy and procedure 09-014 dated June 20, 2012.
- 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.
- (1) pH value potentially biased high due to groundwater quality meter malfunction.
- (2) Not sampled; insufficient amount of groundwater present to collect sample.
- (3) JHC-MW-15008 was decommissioned on June 24, 2019. Replacement well JHC-MW-15008R was installed on June 25, 2019.

Table B1
 Comparison of Groundwater Sampling Results to Groundwater Protection Standards – June 2017 to April 2020
 JH Campbell Pond A – HMP/AMP
 West Olive, Michigan

Sample Location:									JHC-MW-15011										
Sample Date:									8/15/2017	8/15/2017	9/26/2017	9/26/2017	4/25/2018	6/19/2018	11/15/2018	4/23/2019	10/10/2019	2/12/2020	4/15/2020
Constituent	Unit	EPA MCL	EPA RSL	MI Residential*	MI Non-Residential*	MI GSI^	UTL	GWPS		Field Dup		Field Dup							
Appendix III																			
Boron	ug/L	NC	NA	500	500	7,200	54	500	288	271	249	219	--	229	337	440	690	1,910	2,870
Calcium	mg/L	NC	NA	NC	NC	500	40	500	32.9	32.9	31.7	33.6	--	30.3	29.1	43	110	122	112
Chloride	mg/L	250**	NA	250	250	500	70	250	19.6	19.6	17.7	17.7	--	23.0	21.0	18	9.4	5.71	4.16
Fluoride	ug/L	4,000	NA	NC	NC	NC	1,000	4,000	< 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	250**	NA	250	250	500	13	250	15.7	15.9	17.6	17.5	--	26.1	29.2	86	180	192	183
Total Dissolved Solids	mg/L	500**	NA	500	500	500	240	500	188	174	230	154	--	180	150	280	550	654	542
pH, Field	SU	6.5 - 8.5**	NA	6.5 - 8.5	6.5 - 8.5	6.5 - 9.0	5.5 - 8.8	5.5 - 8.8	7.6	--	7.5	--	8.5	8.1	9.1	8.8	8.4	8.0	7.6
Appendix IV																			
Antimony	ug/L	6	NA	6.0	6.0	130	2	6	1.1	1.2	--	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	2	4
Arsenic	ug/L	10	NA	10	10	10	1	10	18.2	17.5	--	--	16.8	15.0	32.2	36	44	31	25
Barium	ug/L	2,000	NA	2,000	2,000	820	35	2,000	171	161	--	--	116	123	98.6	170	360	563	514
Beryllium	ug/L	4	NA	4.0	4.0	18	1	4	< 1.0	< 1.0	--	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1
Cadmium	ug/L	5	NA	5.0	5.0	3.5	0.2	5	< 0.20	< 0.20	--	--	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.2	0.2
Chromium	ug/L	100	NA	100	100	11	2	100	< 1.0	< 1.0	--	--	< 1.0	< 1.0	< 1.0	9.0	1.4	1	< 1
Cobalt	ug/L	NC	6	40	100	100	15	15	< 15.0	< 15.0	--	--	< 15.0	< 15.0	< 6.0	< 6.0	< 6.0	< 6	< 6
Fluoride	ug/L	4,000	NA	NC	NC	NC	1,000	4,000	< 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	NC	15	4.0	4.0	39	1	15	< 1.0	< 1.0	--	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1
Lithium	ug/L	NC	40	170	350	0.20#	10	40	11	13	--	--	14	11	10	< 10	14	22	21
Mercury	ug/L	2	NA	2.0	2.0	0.2	0.2	2	< 0.20	< 0.20	--	--	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.2	< 0.2
Molybdenum	ug/L	NC	100	73	210	3,200	5	100	13.0	13.0	--	--	8.2	8.2	9.3	21	11	12	7
Radium-226	pCi/L	NC	NA	NC	NC	NC	NA	NA	0.291	< 0.707	--	--	< 0.702	< 0.463	< 0.512	0.0720	0.2980	--	0.242
Radium-228	pCi/L	NC	NA	NC	NC	NC	NA	NA	< 0.951	1.02	--	--	< 0.568	0.931	< 0.519	< 0.343	0.665	--	0.606
Radium-226/228	pCi/L	5	NA	NC	NC	NC	1.93	5	< 1.11	1.61	--	--	< 1.27	< 1.34	< 1.03	< 0.343	0.963	--	0.848
Selenium	ug/L	50	NA	50	50	5.0	5	50	< 1.0	< 1.0	--	--	< 1.0	1.6	< 1.0	13	76	104	29
Thallium	ug/L	2	NA	2.0	2.0	3.7	2	2	< 2.0	< 2.0	--	--	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2	< 2

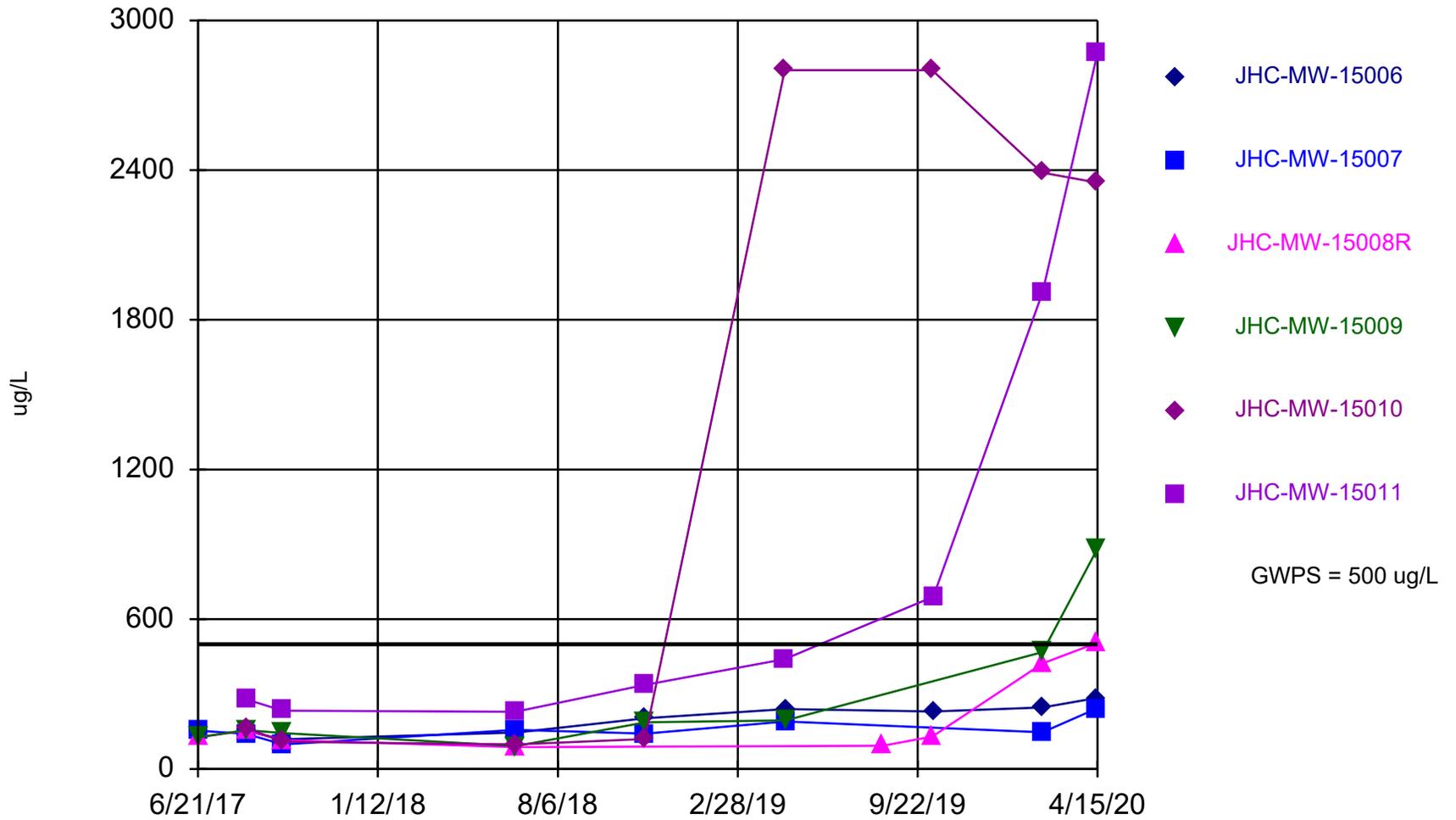
Notes:

- 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.
- NC - no criteria.
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- MCL - Maximum Contaminant Level, EPA Drinking Water Standards and Health Advisories, April 2012.
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- # - 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 EGLE policy and procedure 09-014 dated June 20, 2012.
- 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.
- (1) pH value potentially biased high due to groundwater quality meter malfunction.
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- (3) JHC-MW-15008 was decommissioned on June 24, 2019. Replacement well JHC-MW-15008R was installed on June 25, 2019.

Attachment 1

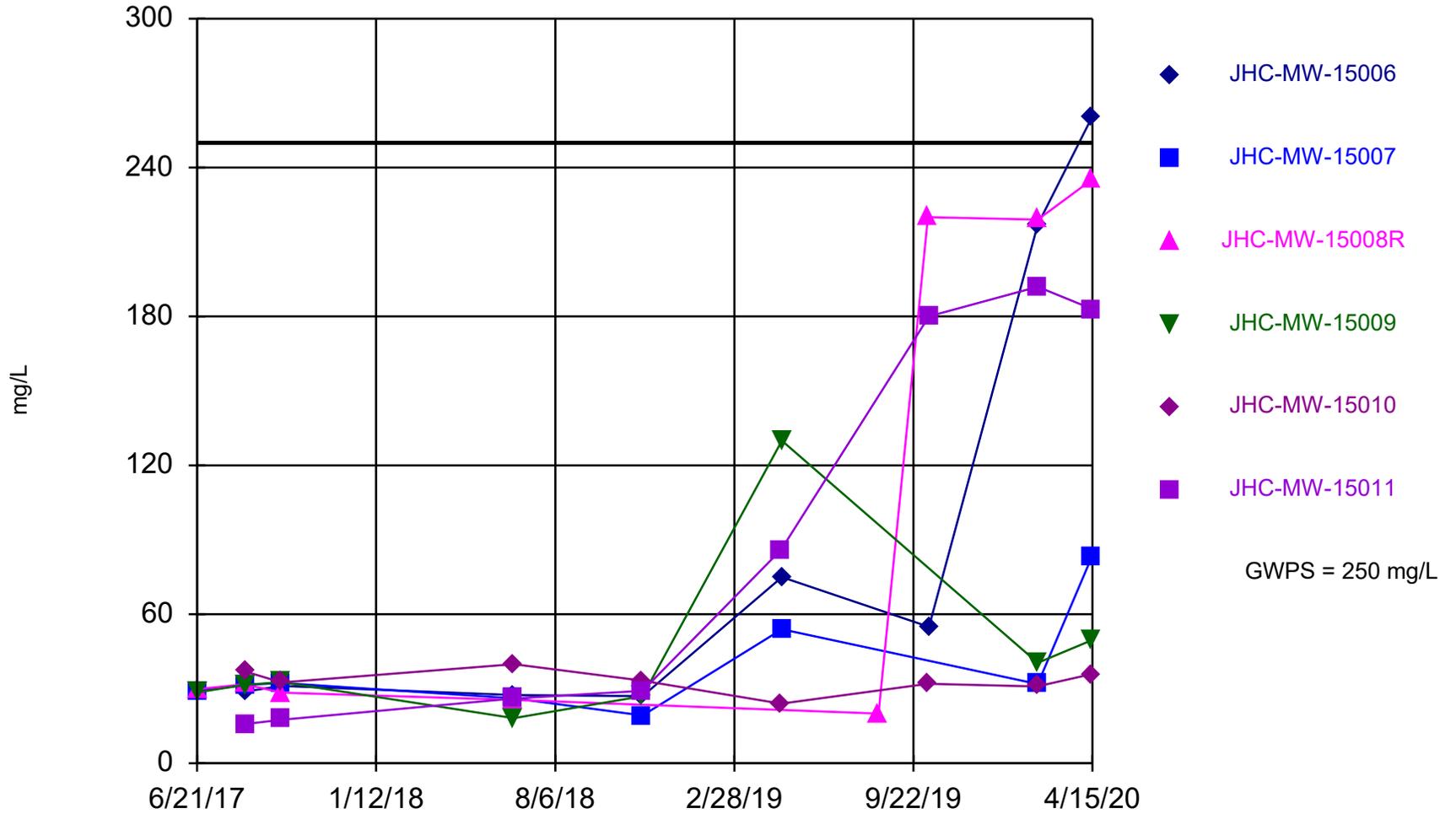
Sanitas™ Output

Boron, Total



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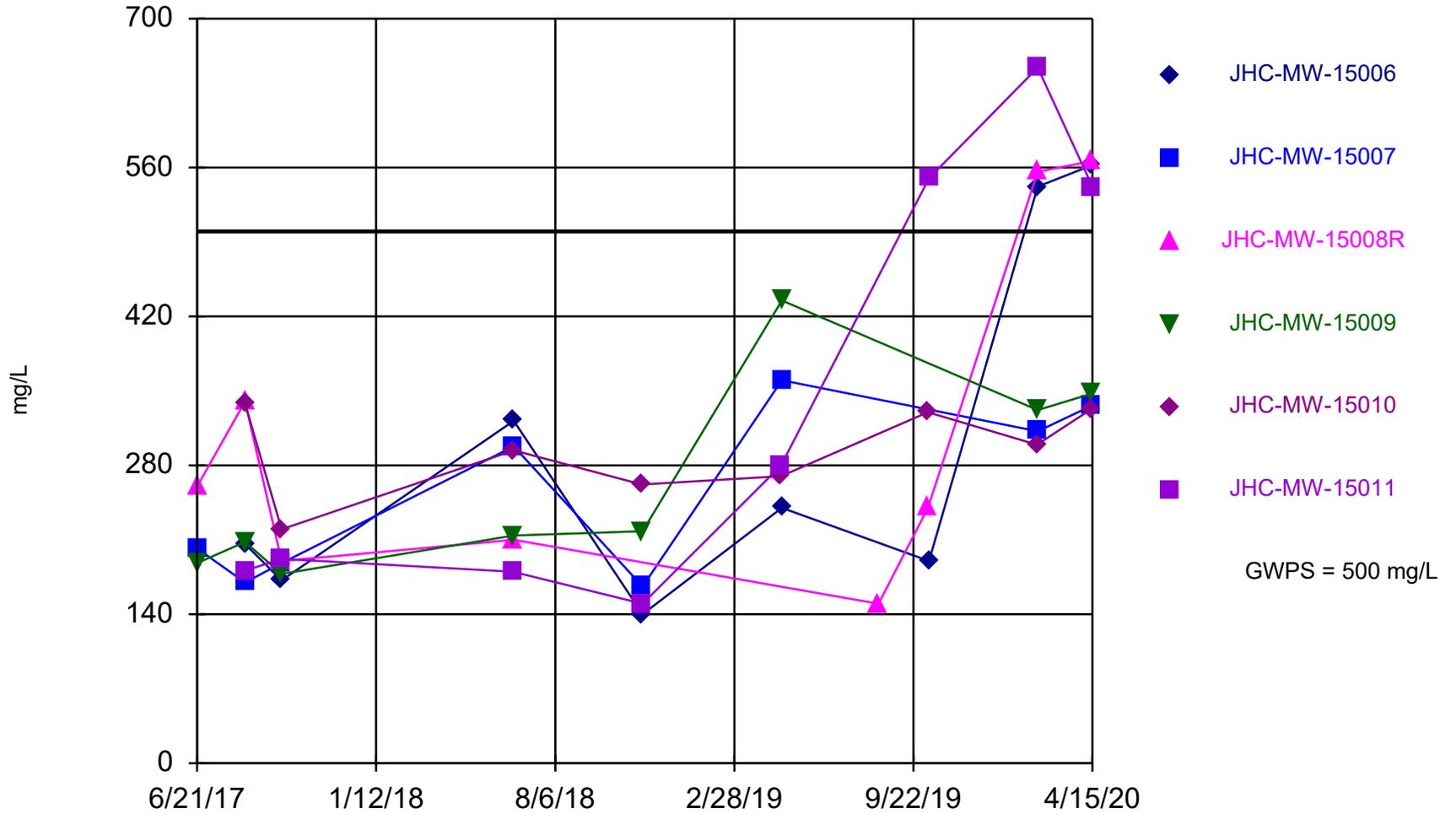
Sulfate



Time Series Analysis Run 7/24/2020 2:42 PM

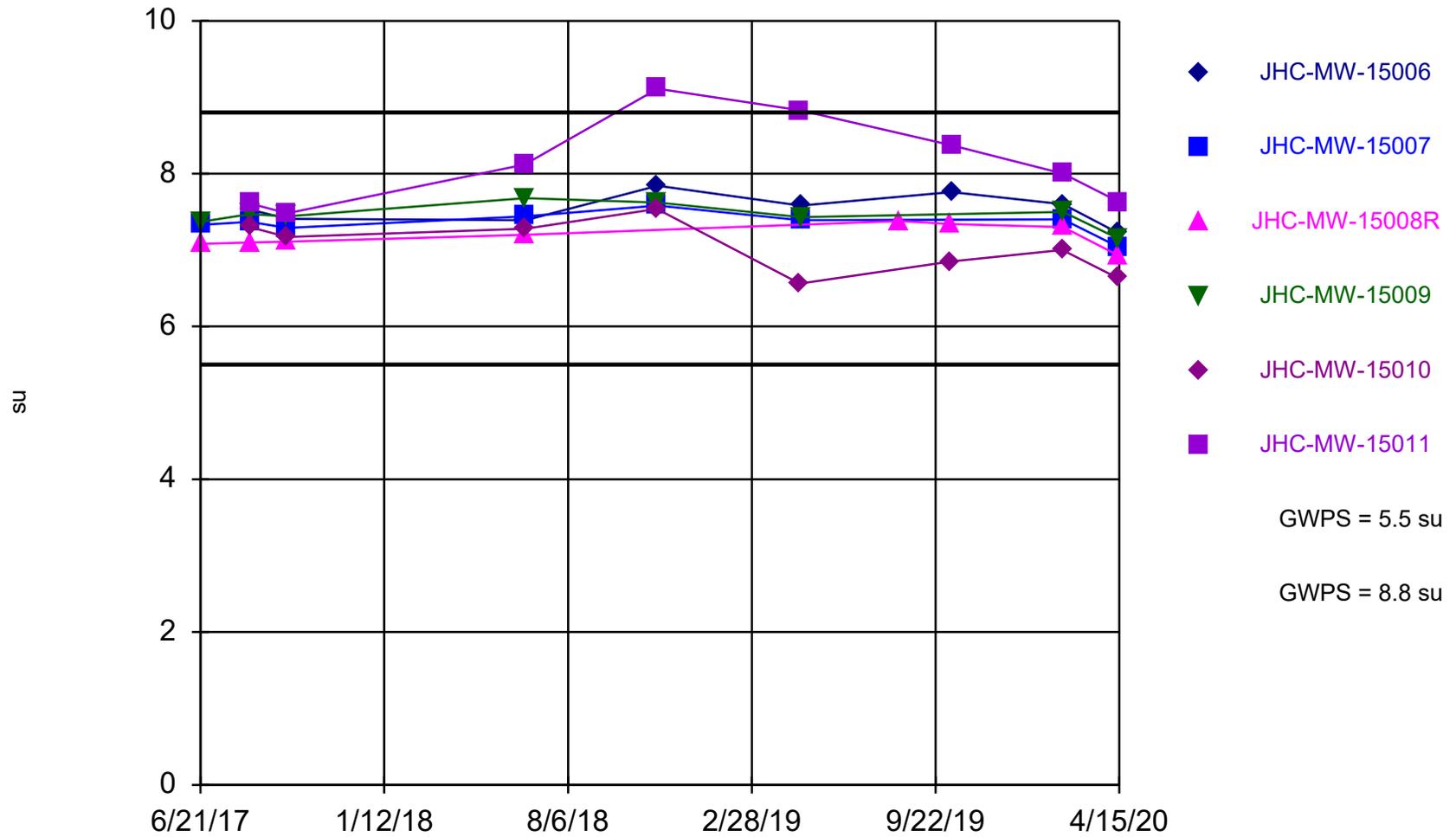
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Total Dissolved Solids



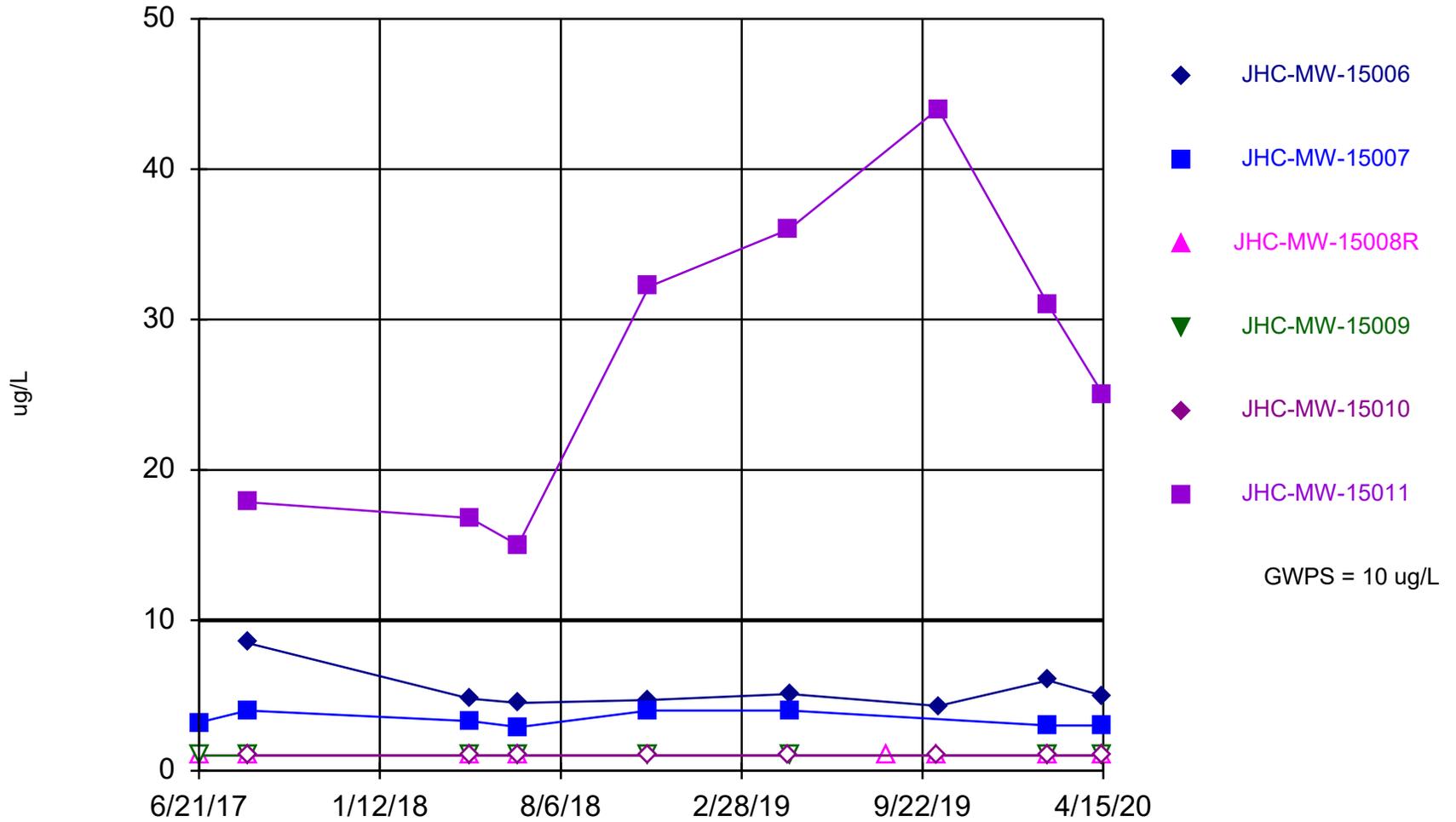
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Client: Consumers Energy Data: JHC_Sanitas_20.05.28

pH, Field



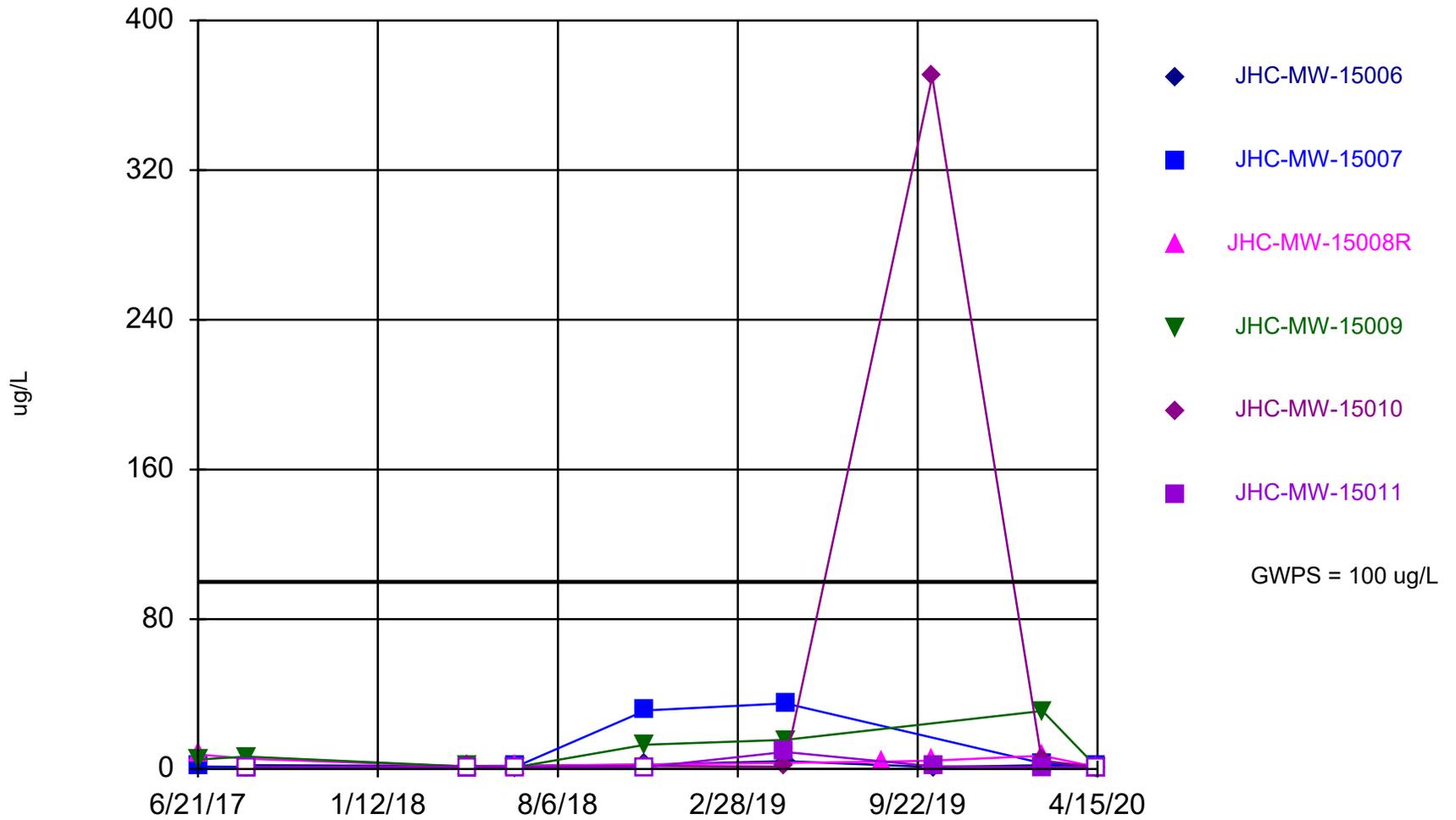
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Arsenic, Total



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Client: Consumers Energy Data: JHC_Sanitas_20.05.28

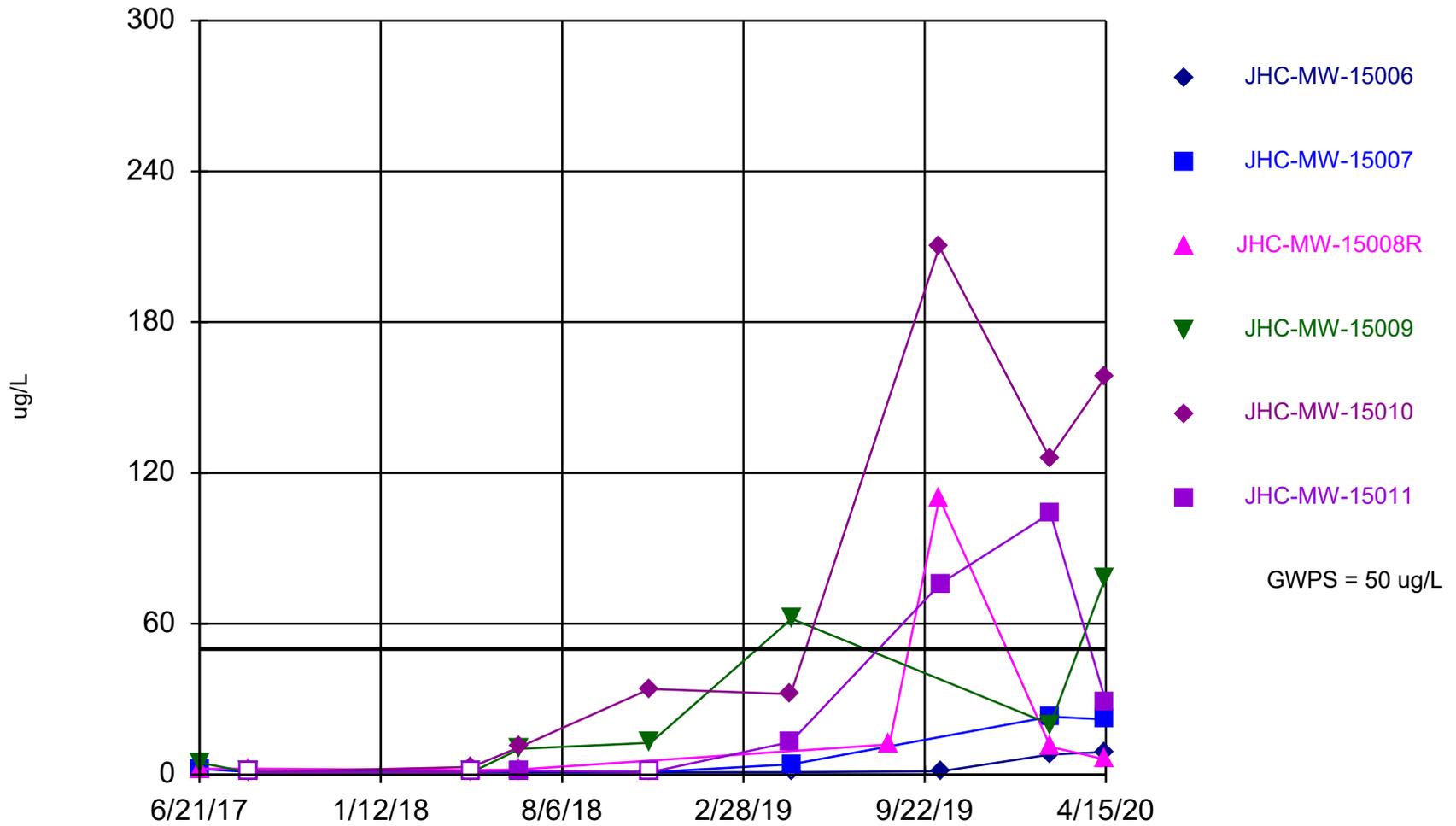
Chromium, Total



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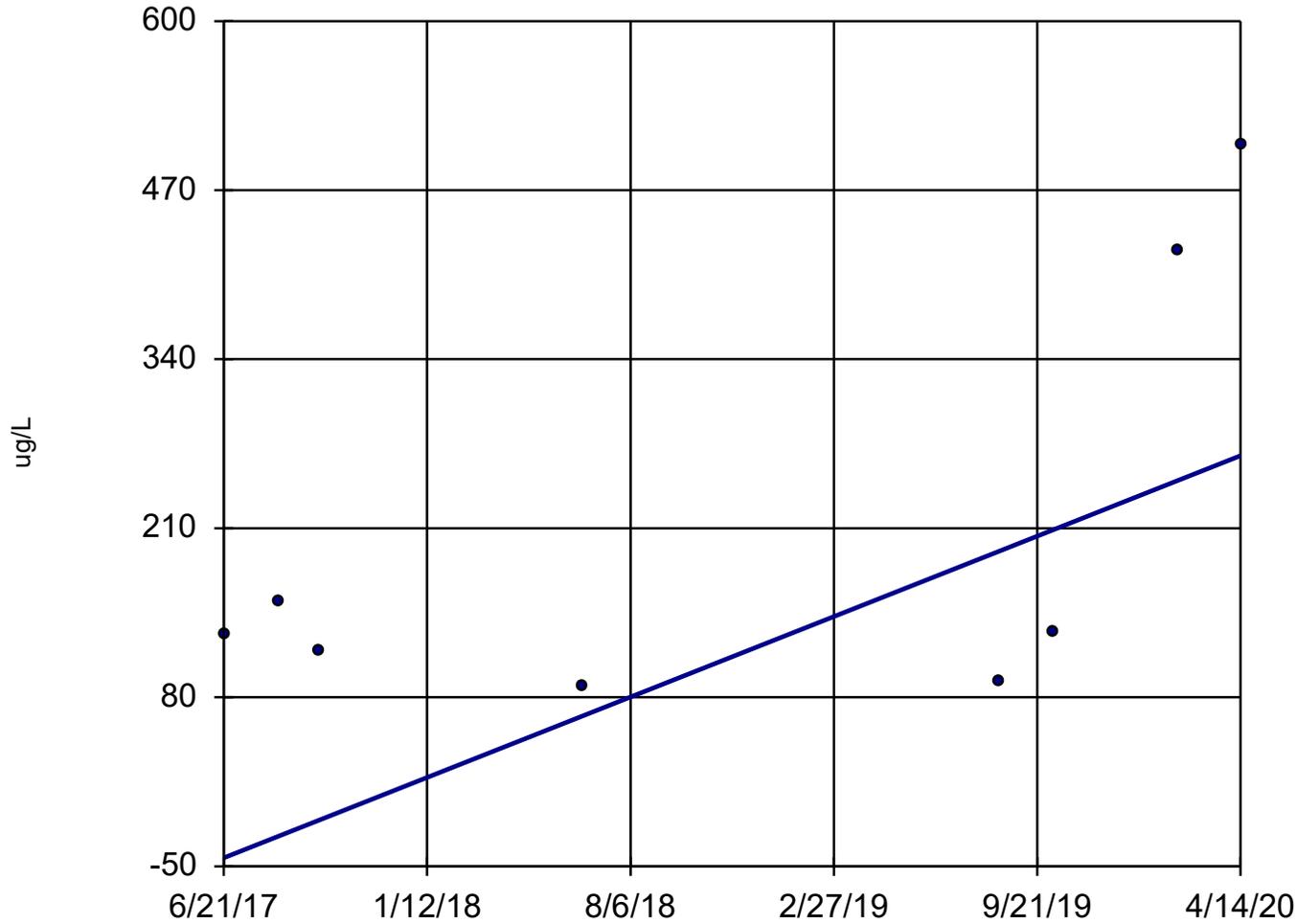
Selenium, Total



Time Series Analysis Run 7/24/2020 2:49 PM
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Sen's Slope Estimator

JHC-MW-15008R



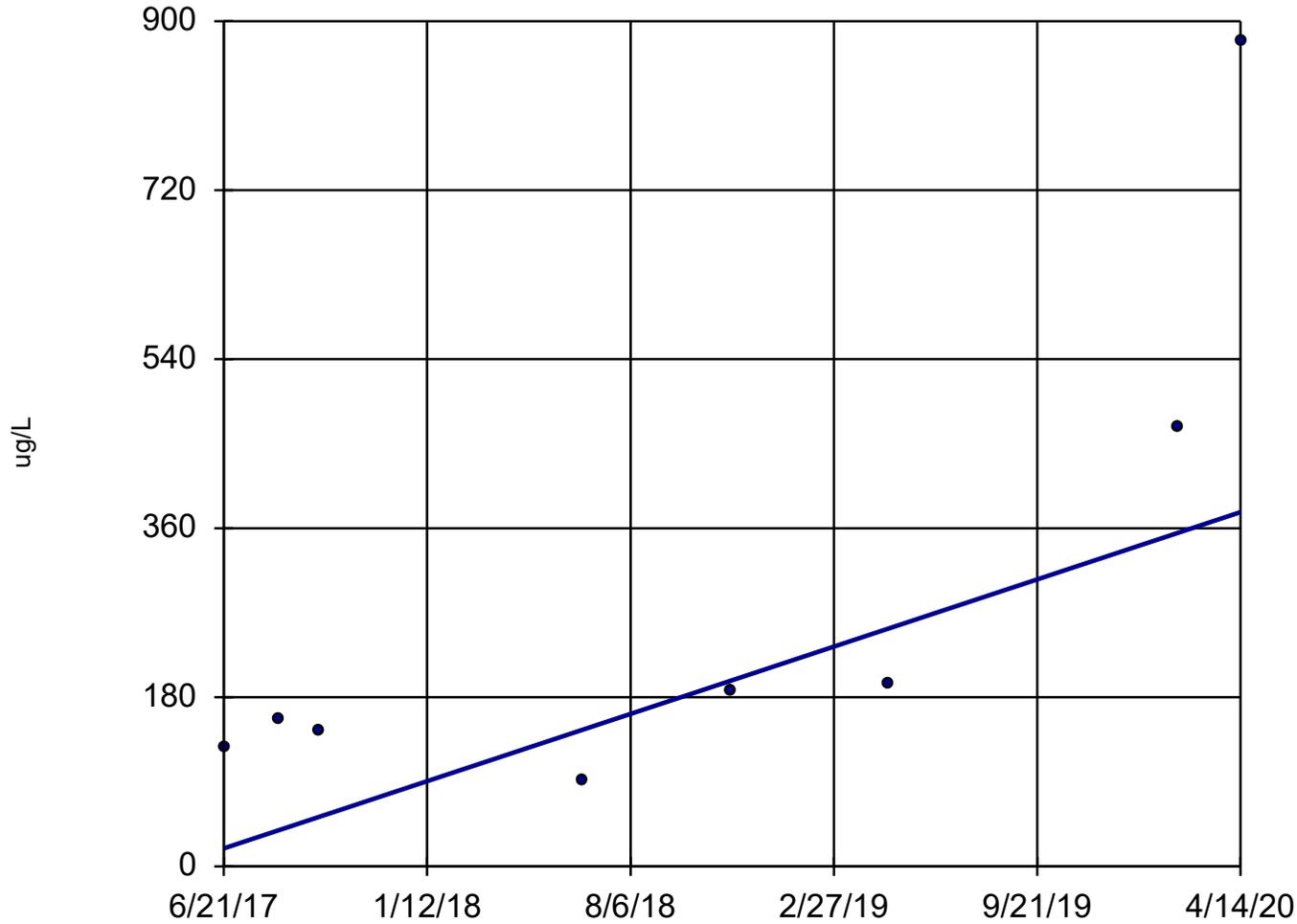
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tail).

Constituent: Boron, Total Analysis Run 6/3/2020 9:26 AM

Client: Consumers Energy Data: JHC_Sanitas_20.05.28

Sen's Slope Estimator

JHC-MW-15009



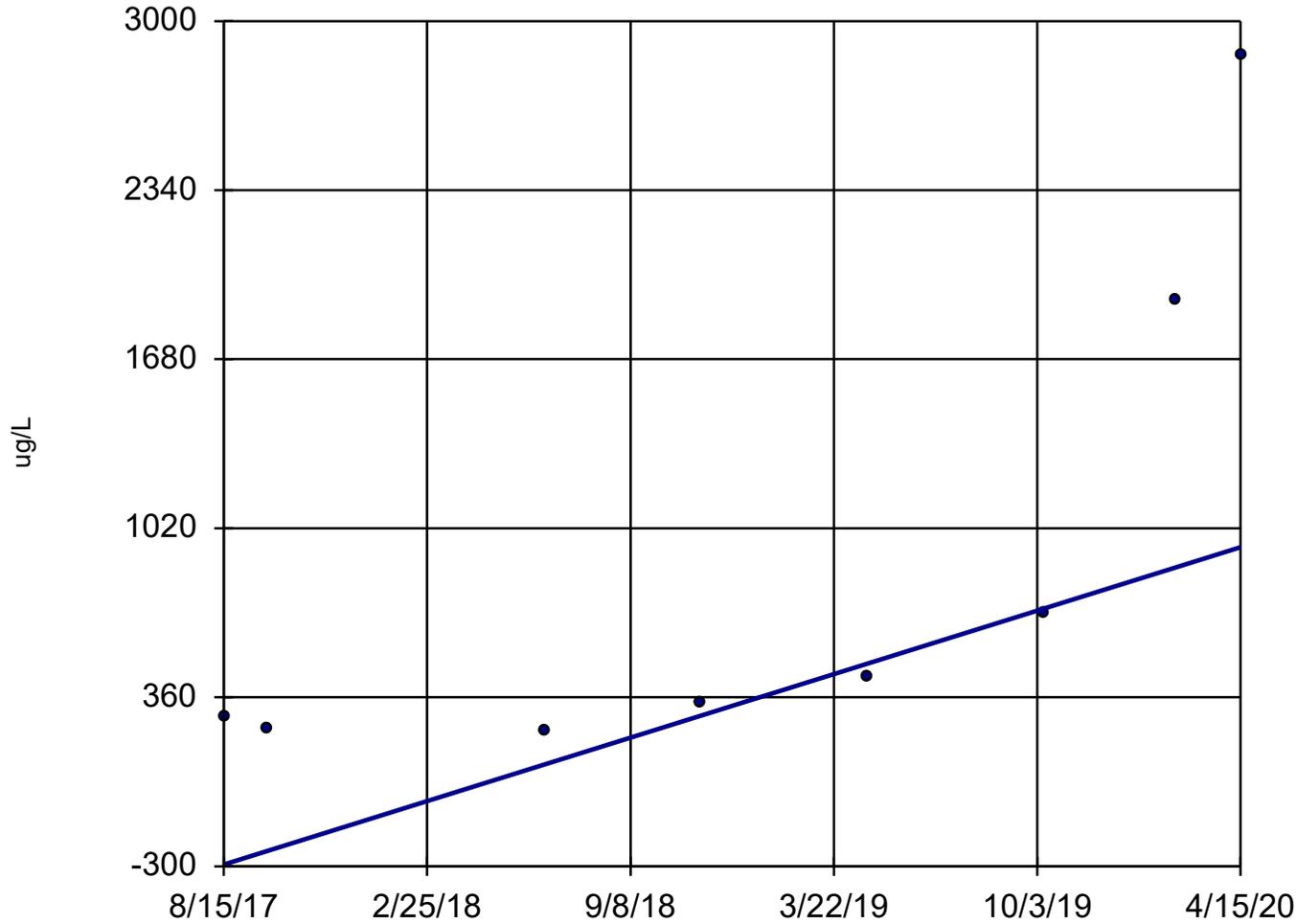
n = 8
Slope = 127.1 units per year.
Mann-Kendall statistic = 20
critical = 20
Trend not significant at 98% confidence level ($\alpha = 0.01$ per tail).

Constituent: Boron, Total Analysis Run 6/3/2020 9:22 AM

Client: Consumers Energy Data: JHC_Sanitas_20.05.28

Sen's Slope Estimator

JHC-MW-15011



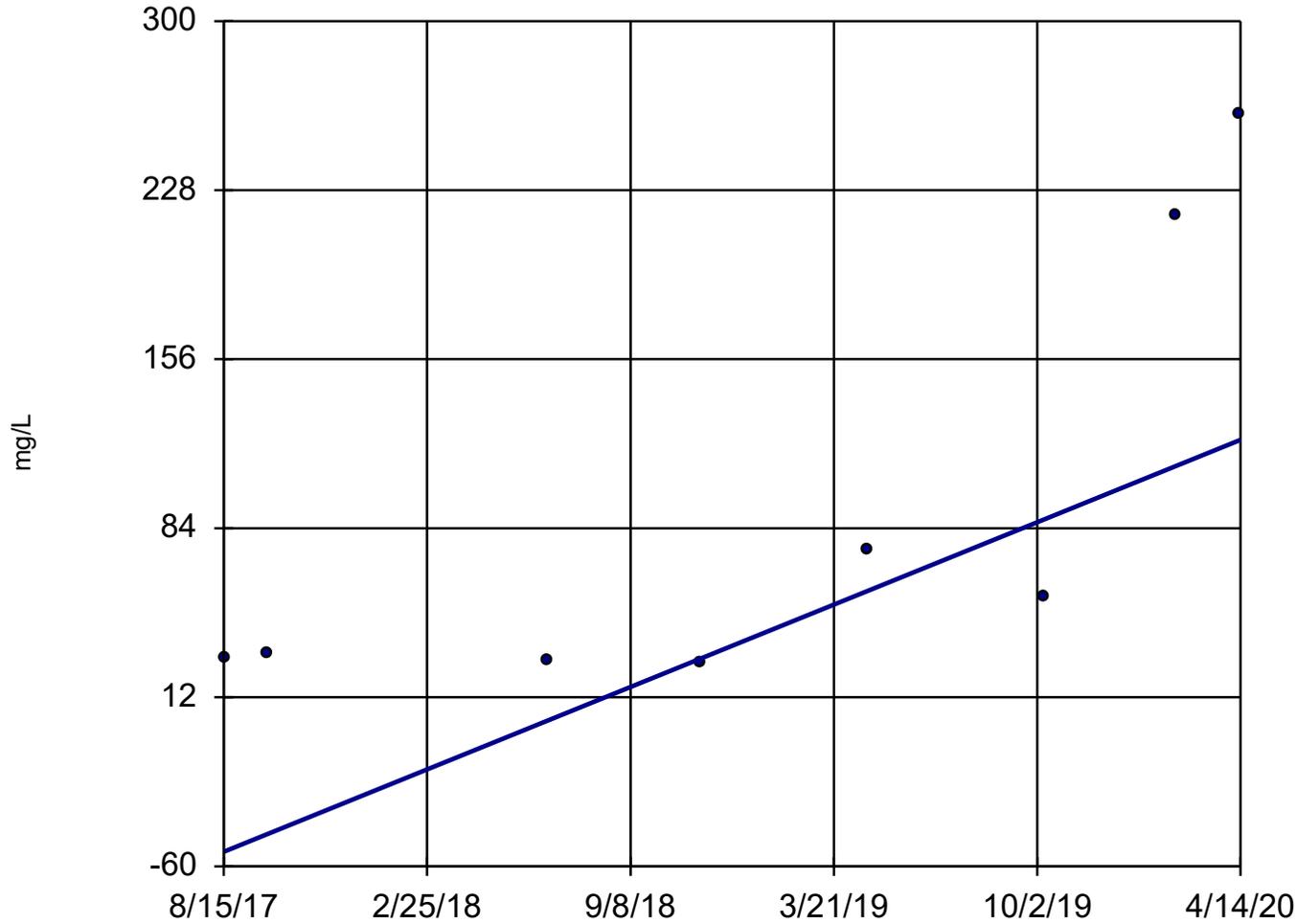
n = 8
Slope = 464.2
units per year.
Mann-Kendall
statistic = 22
critical = 20
Increasing trend
significant at 98%
confidence level
($\alpha = 0.01$ per
tail).

Constituent: Boron, Total Analysis Run 6/3/2020 9:21 AM

Client: Consumers Energy Data: JHC_Sanitas_20.05.28

Sen's Slope Estimator

JHC-MW-15006

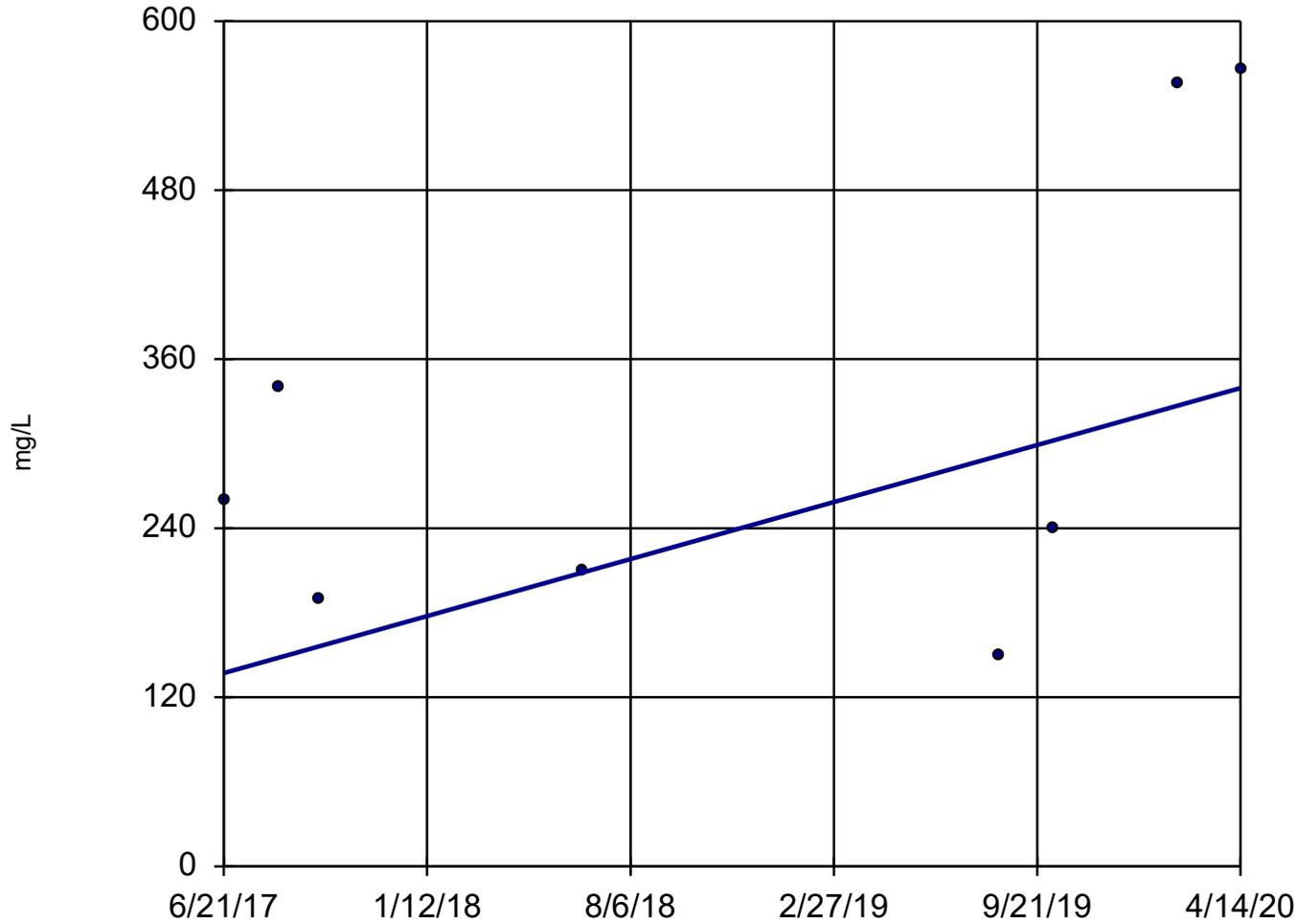


n = 8
Slope = 65.83
units per year.
Mann-Kendall
statistic = 16
critical = 20
Trend not sig-
nificant at 98%
confidence level
($\alpha = 0.01$ per
tail).

Constituent: Sulfate Analysis Run 6/3/2020 9:21 AM
Client: Consumers Energy Data: JHC_Sanitas_20.05.28

Sen's Slope Estimator

JHC-MW-15008R

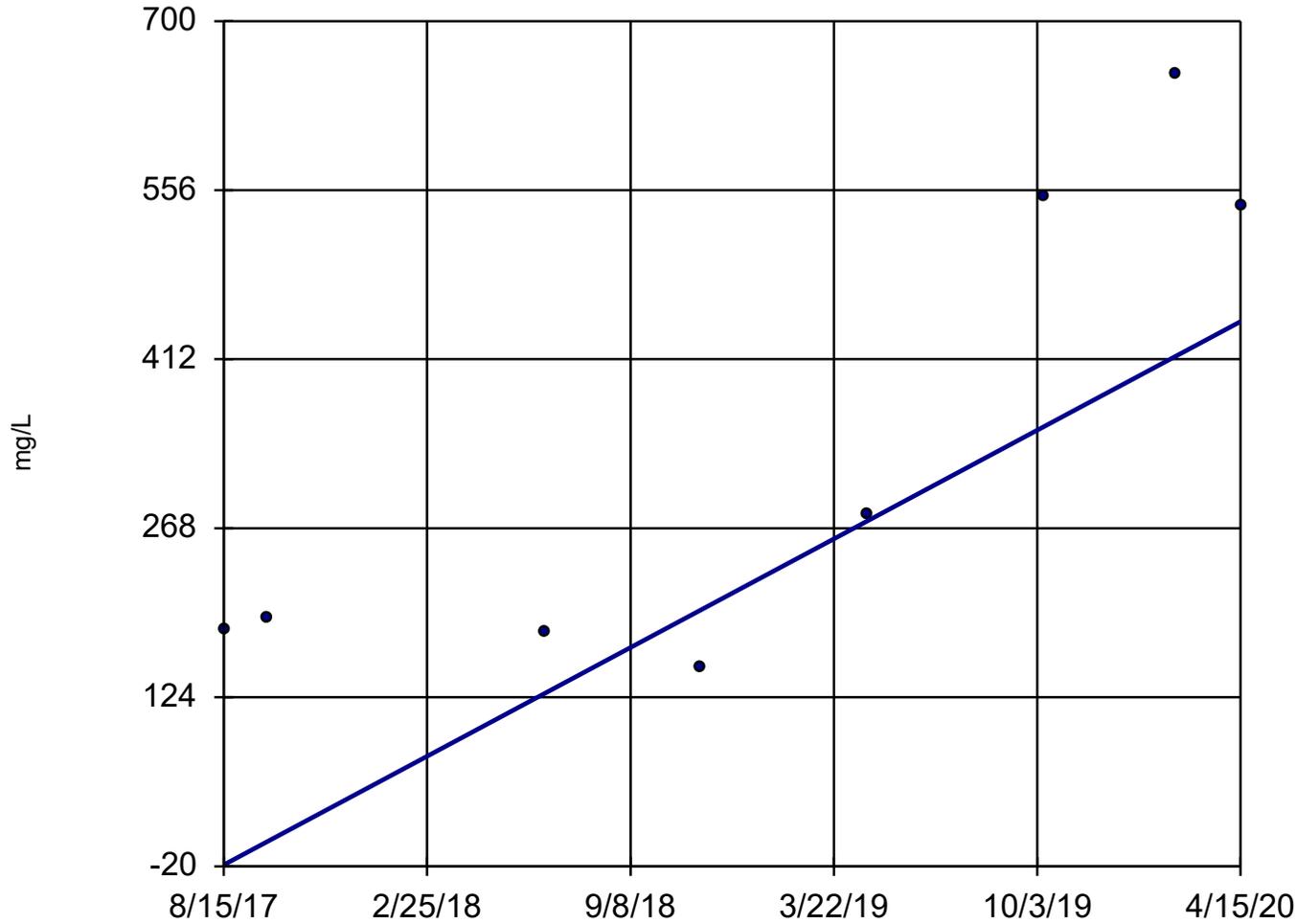


n = 8
Slope = 71.83
units per year.
Mann-Kendall
statistic = 8
critical = 20
Trend not sig-
nificant at 98%
confidence level
($\alpha = 0.01$ per
tail).

Constituent: Total Dissolved Solids Analysis Run 6/3/2020 9:26 AM
Client: Consumers Energy Data: JHC_Sanitas_20.05.28

Sen's Slope Estimator

JHC-MW-15011



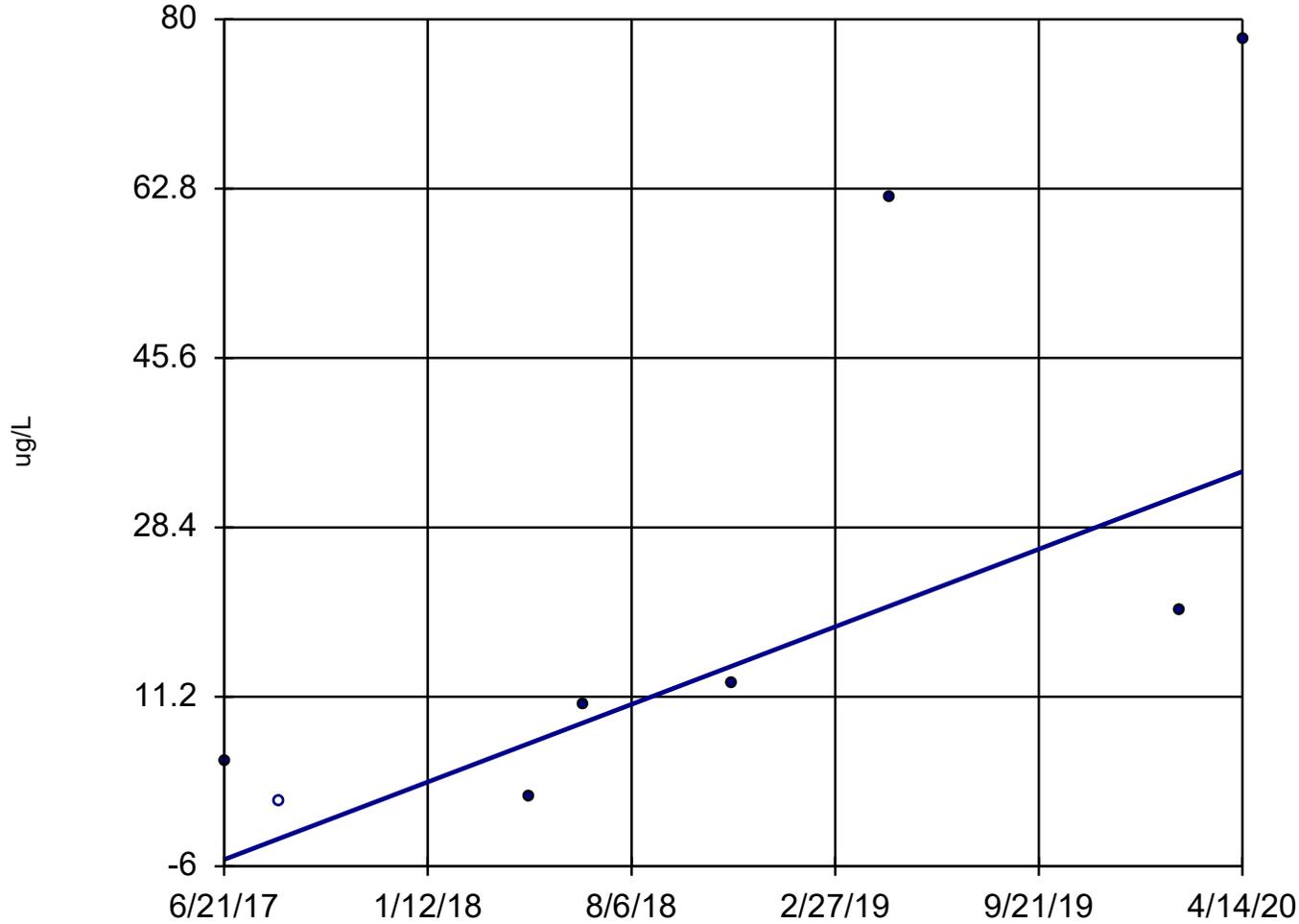
n = 8
Slope = 173.5 units per year.
Mann-Kendall statistic = 14
critical = 20
Trend not significant at 98% confidence level ($\alpha = 0.01$ per tail).

Constituent: Total Dissolved Solids Analysis Run 6/3/2020 9:22 AM

Client: Consumers Energy Data: JHC_Sanitas_20.05.28

Sen's Slope Estimator

JHC-MW-15009



n = 8

Slope = 13.99
units per year.

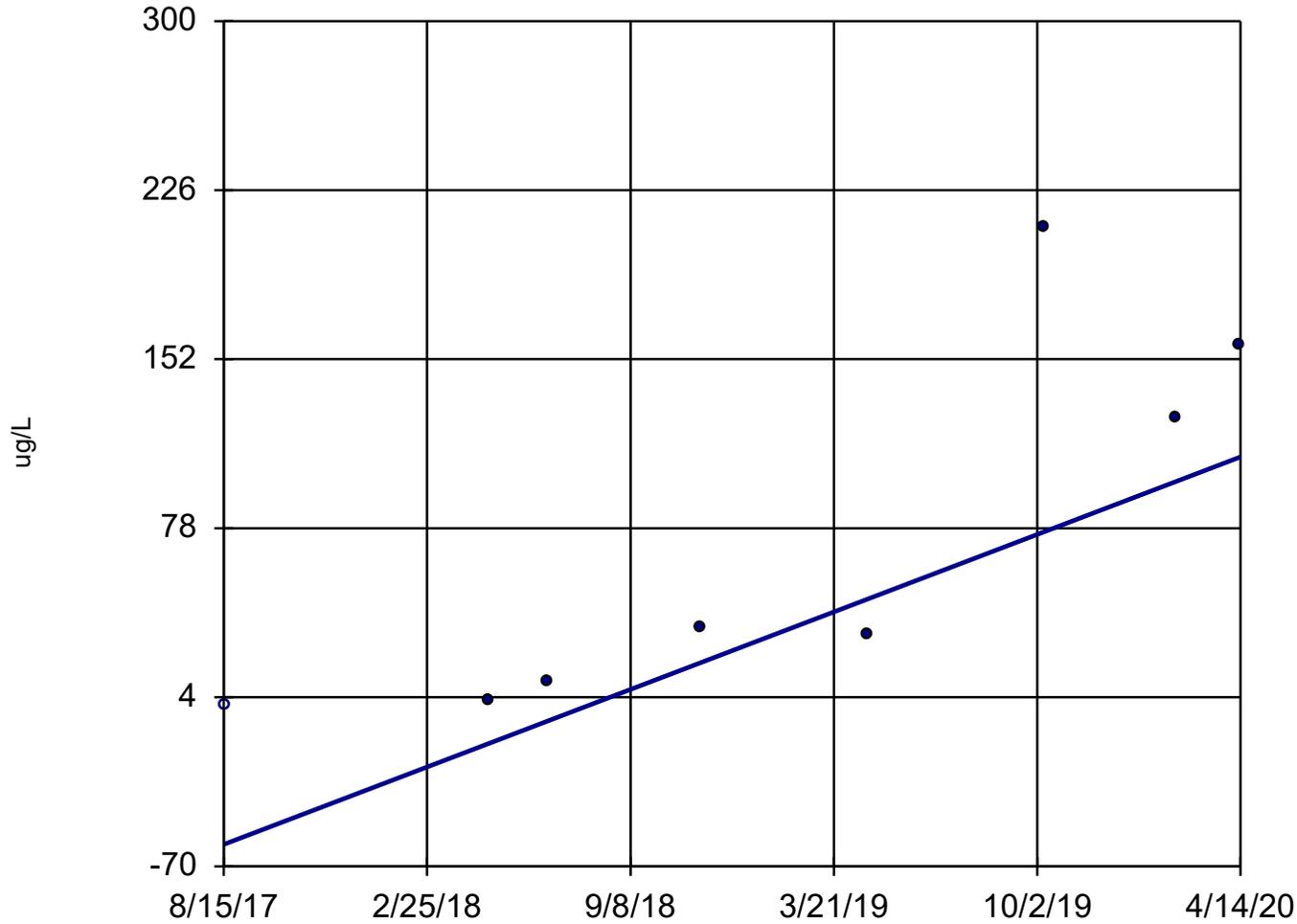
Mann-Kendall
statistic = 22
critical = 20

Increasing trend
significant at 98%
confidence level
($\alpha = 0.01$ per
tail).

Constituent: Selenium, Total Analysis Run 6/3/2020 9:22 AM

Client: Consumers Energy Data: JHC_Sanitas_20.05.28

Sen's Slope Estimator JHC-MW-15010



n = 8
Slope = 63.67
units per year.
Mann-Kendall
statistic = 22
critical = 20
Increasing trend
significant at 98%
confidence level
($\alpha = 0.01$ per
tail).

Constituent: Selenium, Total Analysis Run 6/3/2020 9:21 AM
Client: Consumers Energy Data: JHC_Sanitas_20.05.28

Summary Report

Constituent: Boron, Total Analysis Run 6/3/2020 9:17 AM
 Client: Consumers Energy Data: JHC_Sanitas_20.05.28

For observations made between 6/21/2017 and 4/15/2020, a summary of the selected data set:

Observations = 48
 ND/Trace = 0
 Wells = 6
 Minimum Value = 87.7
 Maximum Value = 2870
 Mean Value = 512.3
 Median Value = 188.8
 Standard Deviation = 791.6
 Coefficient of Variation = 1.545
 Skewness = 2.214

<u>Well</u>	<u>#Obs.</u>	<u>ND/Trace</u>	<u>Min</u>	<u>Max</u>	<u>Mean</u>	<u>Median</u>	<u>Std.Dev.</u>	<u>CV</u>	<u>Skewness</u>
JHC-MW-15006	8	0	119	284	202.4	216.5	58.14	0.2872	-0.1528
JHC-MW-15007	8	0	98	242	158.8	150	42.03	0.2648	0.7633
JHC-MW-15008R	8	0	87.7	505	204.5	129	163	0.7973	1.161
JHC-MW-15009	8	0	91.4	877.5	280.7	171.8	267.6	0.9534	1.616
JHC-MW-15010	8	0	98.4	2800	1354	1257	1326	0.9796	0.04427
JHC-MW-15011	8	0	229	2870	873.7	388.5	981.8	1.124	1.305

Summary Report

Constituent: Sulfate Analysis Run 6/3/2020 9:17 AM
Client: Consumers Energy Data: JHC_Sanitas_20.05.28

For observations made between 6/21/2017 and 4/15/2020, a summary of the selected data set:

Observations = 48
ND/Trace = 0
Wells = 6
Minimum Value = 15.8
Maximum Value = 260
Mean Value = 66.49
Median Value = 31.95
Standard Deviation = 70.06
Coefficient of Variation = 1.054
Skewness = 1.626

<u>Well</u>	<u>#Obs.</u>	<u>ND/Trace</u>	<u>Min</u>	<u>Max</u>	<u>Mean</u>	<u>Median</u>	<u>Std.Dev.</u>	<u>CV</u>	<u>Skewness</u>
JHC-MW-15006	8	0	27	260	90.19	43.05	93.78	1.04	1.103
JHC-MW-15007	8	0	19.2	83	38.41	31.75	20.57	0.5355	1.437
JHC-MW-15008R	8	0	20	235	101.2	30.8	102.4	1.012	0.5197
JHC-MW-15009	8	0	18.2	130	44.76	32.15	35.67	0.7969	1.974
JHC-MW-15010	8	0	24	39.9	33.21	32.95	4.753	0.1431	-0.5969
JHC-MW-15011	8	0	15.8	192	91.21	57.6	80.79	0.8858	0.3344

Summary Report

Constituent: Total Dissolved Solids Analysis Run 6/3/2020 9:16 AM
 Client: Consumers Energy Data: JHC_Sanitas_20.05.28

For observations made between 6/21/2017 and 4/15/2020, a summary of the selected data set:

Observations = 48
 ND/Trace = 0
 Wells = 6
 Minimum Value = 140
 Maximum Value = 654
 Mean Value = 294
 Median Value = 261
 Standard Deviation = 133.2
 Coefficient of Variation = 0.4529
 Skewness = 1.136

<u>Well</u>	<u>#Obs.</u>	<u>ND/Trace</u>	<u>Min</u>	<u>Max</u>	<u>Mean</u>	<u>Median</u>	<u>Std.Dev.</u>	<u>CV</u>	<u>Skewness</u>
JHC-MW-15006	8	0	140	562	296.8	223	166.5	0.5612	0.8429
JHC-MW-15007	8	0	166	360	254	250	80.29	0.3161	0.09455
JHC-MW-15008R	8	0	150	566	314	250	162.2	0.5166	0.7937
JHC-MW-15009	8	0	178	435	265.1	216	93.92	0.3543	0.7791
JHC-MW-15010	8	0	220	338	293.3	296.8	41.15	0.1403	-0.5172
JHC-MW-15011	8	0	150	654	341.1	236	205.6	0.6028	0.5099

Summary Report

Constituent: pH, Field Analysis Run 6/3/2020 9:15 AM
 Client: Consumers Energy Data: JHC_Sanitas_20.05.28

For observations made between 6/21/2017 and 4/15/2020, a summary of the selected data set:

Observations = 48
 ND/Trace = 0
 Wells = 6
 Minimum Value = 6.56
 Maximum Value = 9.11
 Mean Value = 7.453
 Median Value = 7.395
 Standard Deviation = 0.4613
 Coefficient of Variation = 0.06189
 Skewness = 1.419

<u>Well</u>	<u>#Obs.</u>	<u>ND/Trace</u>	<u>Min</u>	<u>Max</u>	<u>Mean</u>	<u>Median</u>	<u>Std.Dev.</u>	<u>CV</u>	<u>Skewness</u>
JHC-MW-15006	8	0	7.22	7.84	7.541	7.555	0.202	0.02678	-0.02751
JHC-MW-15007	8	0	7.04	7.58	7.355	7.38	0.1537	0.0209	-0.8159
JHC-MW-15008R	8	0	6.93	7.38	7.18	7.155	0.1532	0.02133	-0.1551
JHC-MW-15009	8	0	7.15	7.68	7.458	7.455	0.1609	0.02157	-0.5278
JHC-MW-15010	8	0	6.56	7.54	7.041	7.085	0.344	0.04885	-0.1161
JHC-MW-15011	8	0	7.48	9.11	8.144	8.06	0.5936	0.07289	0.4774

Summary Report

Constituent: Arsenic, Total Analysis Run 6/3/2020 9:15 AM
 Client: Consumers Energy Data: JHC_Sanitas_20.05.28

For observations made between 6/21/2017 and 4/15/2020, a summary of the selected data set:

Observations = 48
 ND/Trace = 24
 Wells = 6
 Minimum Value = 1
 Maximum Value = 44
 Mean Value = 6.503
 Median Value = 1.95
 Standard Deviation = 10.33
 Coefficient of Variation = 1.588
 Skewness = 2.25

<u>Well</u>	<u>#Obs.</u>	<u>ND/Trace</u>	<u>Min</u>	<u>Max</u>	<u>Mean</u>	<u>Median</u>	<u>Std.Dev.</u>	<u>CV</u>	<u>Skewness</u>
JHC-MW-15006	8	0	4.3	8.5	5.363	4.9	1.367	0.2549	1.72
JHC-MW-15007	8	0	2.9	4	3.425	3.25	0.4921	0.1437	0.3316
JHC-MW-15008R	8	8	1	1	1	1	0	0	NaN
JHC-MW-15009	8	8	1	1	1	1	0	0	NaN
JHC-MW-15010	8	8	1	1	1	1	0	0	NaN
JHC-MW-15011	8	0	15	44	27.23	28	10.34	0.3797	0.2437

Summary Report

Constituent: Chromium, Total Analysis Run 6/3/2020 9:14 AM
 Client: Consumers Energy Data: JHC_Sanitas_20.05.28

For observations made between 6/21/2017 and 4/15/2020, a summary of the selected data set:

Observations = 48
 ND/Trace = 10
 Wells = 6
 Minimum Value = 1
 Maximum Value = 370
 Mean Value = 12.42
 Median Value = 1.5
 Standard Deviation = 53.29
 Coefficient of Variation = 4.291
 Skewness = 6.491

<u>Well</u>	<u>#Obs.</u>	<u>ND/Trace</u>	<u>Min</u>	<u>Max</u>	<u>Mean</u>	<u>Median</u>	<u>Std.Dev.</u>	<u>CV</u>	<u>Skewness</u>
JHC-MW-15006	8	1	1	4.1	1.944	1.825	0.989	0.5088	1.307
JHC-MW-15007	8	1	1	35	9.475	1.6	14.66	1.547	1.164
JHC-MW-15008R	8	1	1	7.8	4.038	4.15	2.625	0.65	0.1436
JHC-MW-15009	8	1	1	31	9.294	5.8	10.35	1.114	1.206
JHC-MW-15010	8	1	1	370	47.71	1.3	130.2	2.729	2.267
JHC-MW-15011	8	5	1	9	2.05	1	2.812	1.372	2.257

Summary Report

Constituent: Selenium, Total Analysis Run 6/3/2020 9:14 AM
 Client: Consumers Energy Data: JHC_Sanitas_20.05.28

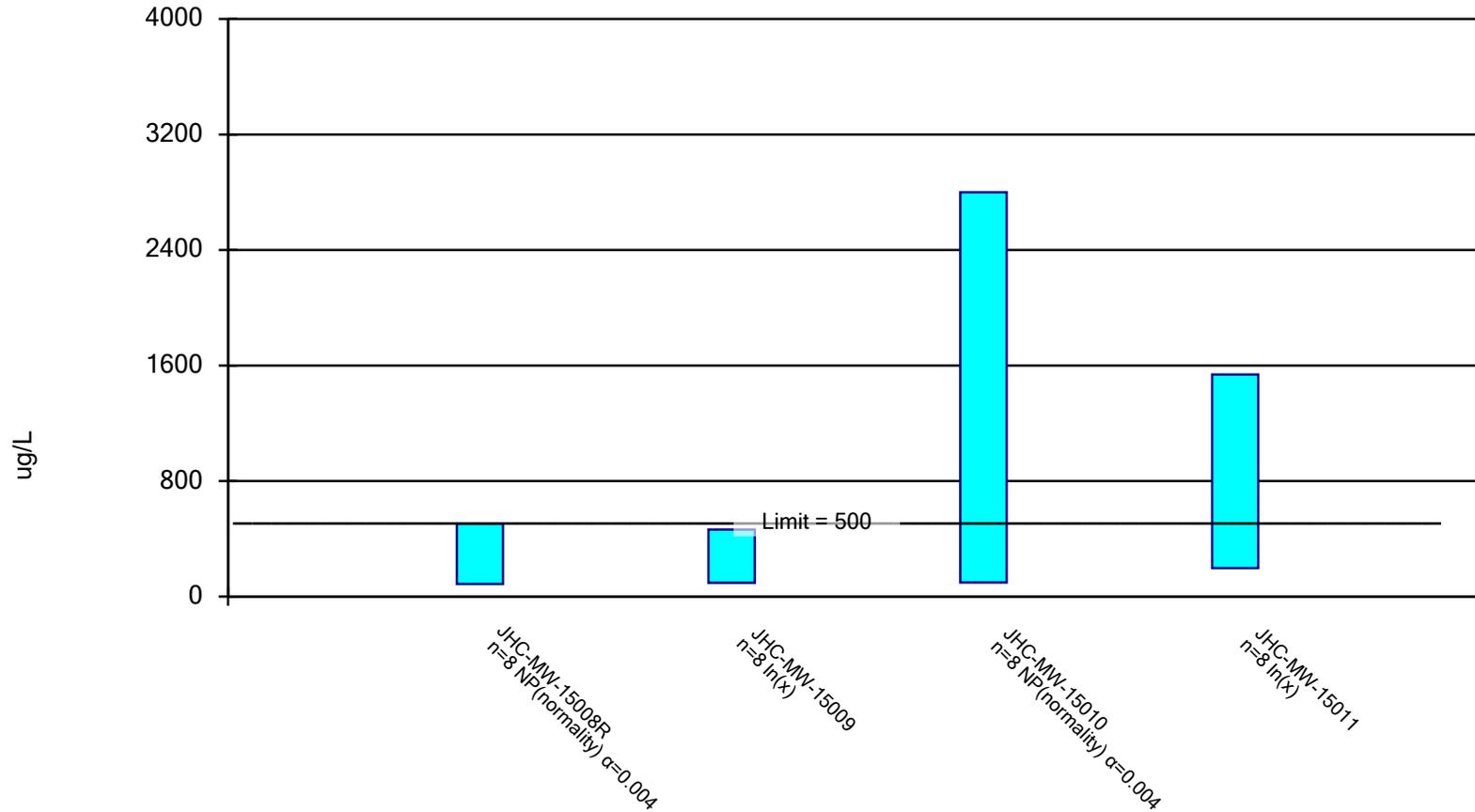
For observations made between 6/21/2017 and 4/15/2020, a summary of the selected data set:

Observations = 48
 ND/Trace = 11
 Wells = 6
 Minimum Value = 1
 Maximum Value = 210
 Mean Value = 25.38
 Median Value = 4.4
 Standard Deviation = 45.71
 Coefficient of Variation = 1.801
 Skewness = 2.408

<u>Well</u>	<u>#Obs.</u>	<u>ND/Trace</u>	<u>Min</u>	<u>Max</u>	<u>Mean</u>	<u>Median</u>	<u>Std.Dev.</u>	<u>CV</u>	<u>Skewness</u>
JHC-MW-15006	8	4	1	9	2.95	1.15	3.438	1.166	1.171
JHC-MW-15007	8	2	1	23	6.963	1.75	9.649	1.386	1.12
JHC-MW-15008R	8	0	1.7	110	18.43	4.2	37.23	2.021	2.213
JHC-MW-15009	8	1	1	78	23.7	11.45	29.58	1.248	1.076
JHC-MW-15010	8	1	1	210	71.89	33.05	80.99	1.127	0.6915
JHC-MW-15011	8	3	1	104	28.33	7.3	39.98	1.411	1.094

Parametric and Non-Parametric (NP) Confidence Interval

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



Constituent: Boron, Total Analysis Run 6/3/2020 9:34 AM

Client: Consumers Energy Data: JHC_Sanitas_20.05.28

Confidence Interval

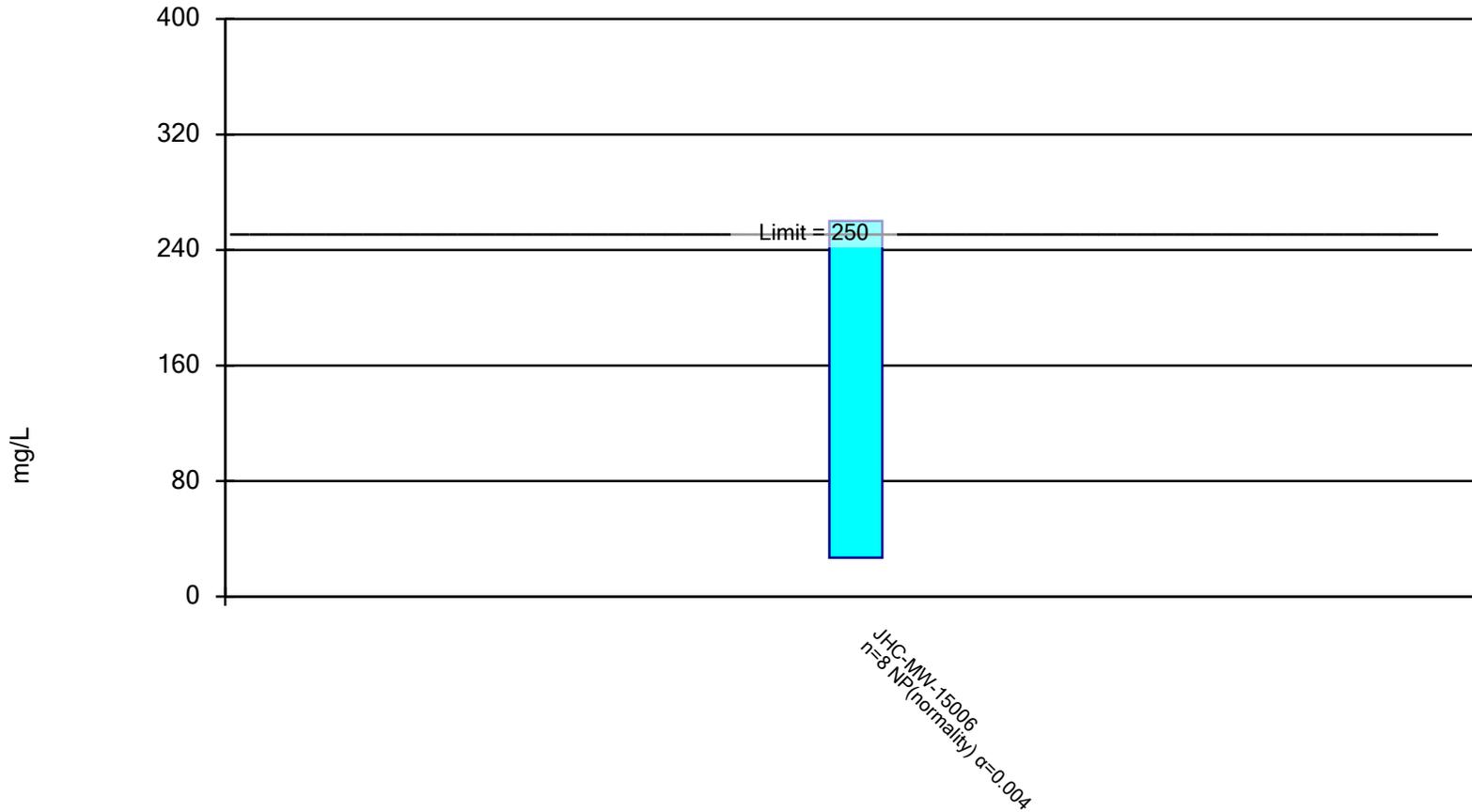
Constituent: Boron, Total (ug/L) Analysis Run 6/3/2020 9:34 AM

Client: Consumers Energy Data: JHC_Sanitas_20.05.28

	JHC-MW-15008R	JHC-MW-15009	JHC-MW-15010	JHC-MW-15011
6/21/2017	128	126		
8/15/2017	153	156	164	279.5 (D)
9/26/2017	116	144	109	234 (D)
6/19/2018				229
6/20/2018	87.7	91.4	98.4	
11/14/2018			120	
11/15/2018		187.5 (D)		337
4/23/2019			2800	440
4/24/2019		195 (D)		
8/13/2019	93			
10/9/2019	130 (D)		2800	
10/10/2019				690
2/11/2020			2390 (D)	
2/12/2020	423	468		1910
4/14/2020	505	877.5 (D)	2350	
4/15/2020				2870
Mean	204.5	280.7	1354	873.7
Std. Dev.	163	267.6	1326	981.8
Upper Lim.	505	464.3	2800	1537
Lower Lim.	87.7	95.62	98.4	196.9

Non-Parametric Confidence Interval

Compliance Limit is not exceeded.



Constituent: Sulfate Analysis Run 6/3/2020 9:38 AM
Client: Consumers Energy Data: JHC_Sanitas_20.05.28

Confidence Interval

Constituent: Sulfate (mg/L) Analysis Run 6/3/2020 9:38 AM

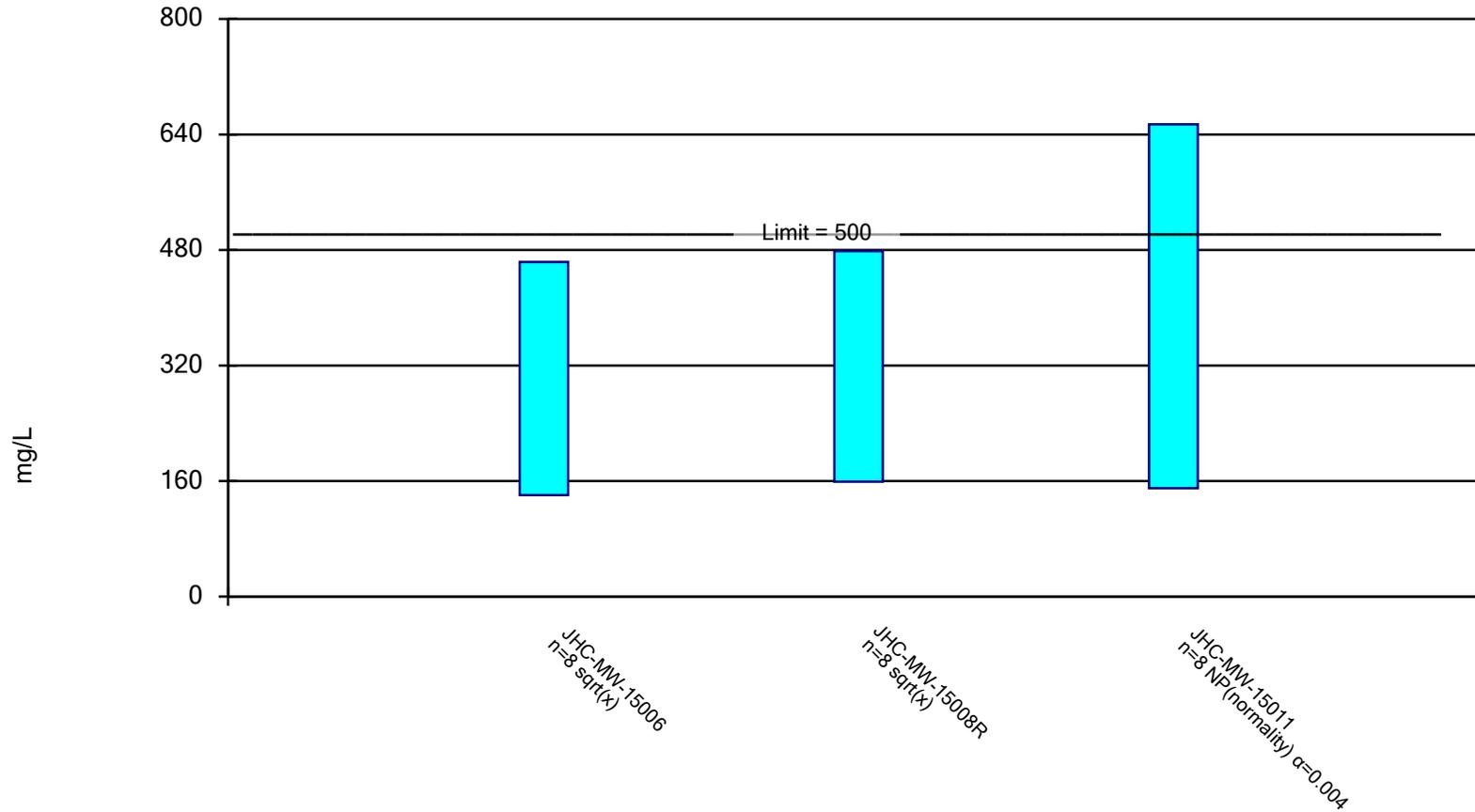
Client: Consumers Energy Data: JHC_Sanitas_20.05.28

JHC-MW-15006

8/15/2017	28.9
9/26/2017	31.1
6/20/2018	27.5 (D)
11/15/2018	27
4/24/2019	75
10/10/2019	55
2/12/2020	217
4/14/2020	260
Mean	90.19
Std. Dev.	93.78
Upper Lim.	260
Lower Lim.	27

Parametric and Non-Parametric (NP) Confidence Interval

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



Constituent: Total Dissolved Solids Analysis Run 6/3/2020 9:36 AM

Client: Consumers Energy Data: JHC_Sanitas_20.05.28

Confidence Interval

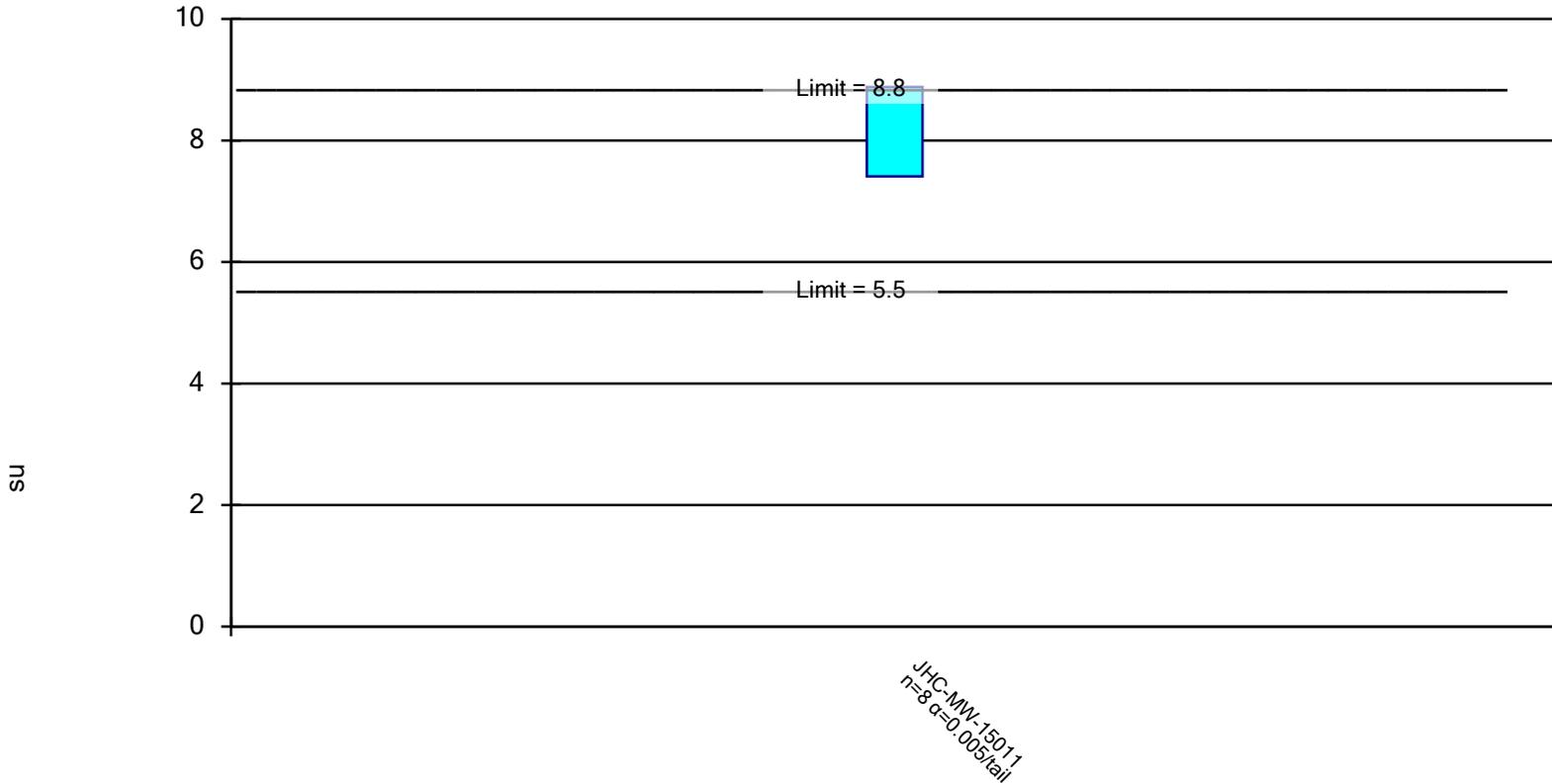
Constituent: Total Dissolved Solids (mg/L) Analysis Run 6/3/2020 9:37 AM

Client: Consumers Energy Data: JHC_Sanitas_20.05.28

	JHC-MW-15006	JHC-MW-15008R	JHC-MW-15011
6/21/2017		260	
8/15/2017	206	340	181 (D)
9/26/2017	172	190	192 (D)
6/19/2018			180
6/20/2018	322 (D)	210	
11/15/2018	140		150
4/23/2019			280
4/24/2019	240		
8/13/2019		150	
10/9/2019		240 (D)	
10/10/2019	190		550
2/12/2020	542	556	654
4/14/2020	562	566	
4/15/2020			542
Mean	296.8	314	341.1
Std. Dev.	166.5	162.2	205.6
Upper Lim.	463.5	478.2	654
Lower Lim.	140.4	159.2	150

Parametric Confidence Interval

Compliance Limit is not exceeded. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: pH, Field Analysis Run 6/3/2020 9:39 AM

Client: Consumers Energy Data: JHC_Sanitas_20.05.28

Confidence Interval

Constituent: pH, Field (su) Analysis Run 6/3/2020 9:39 AM

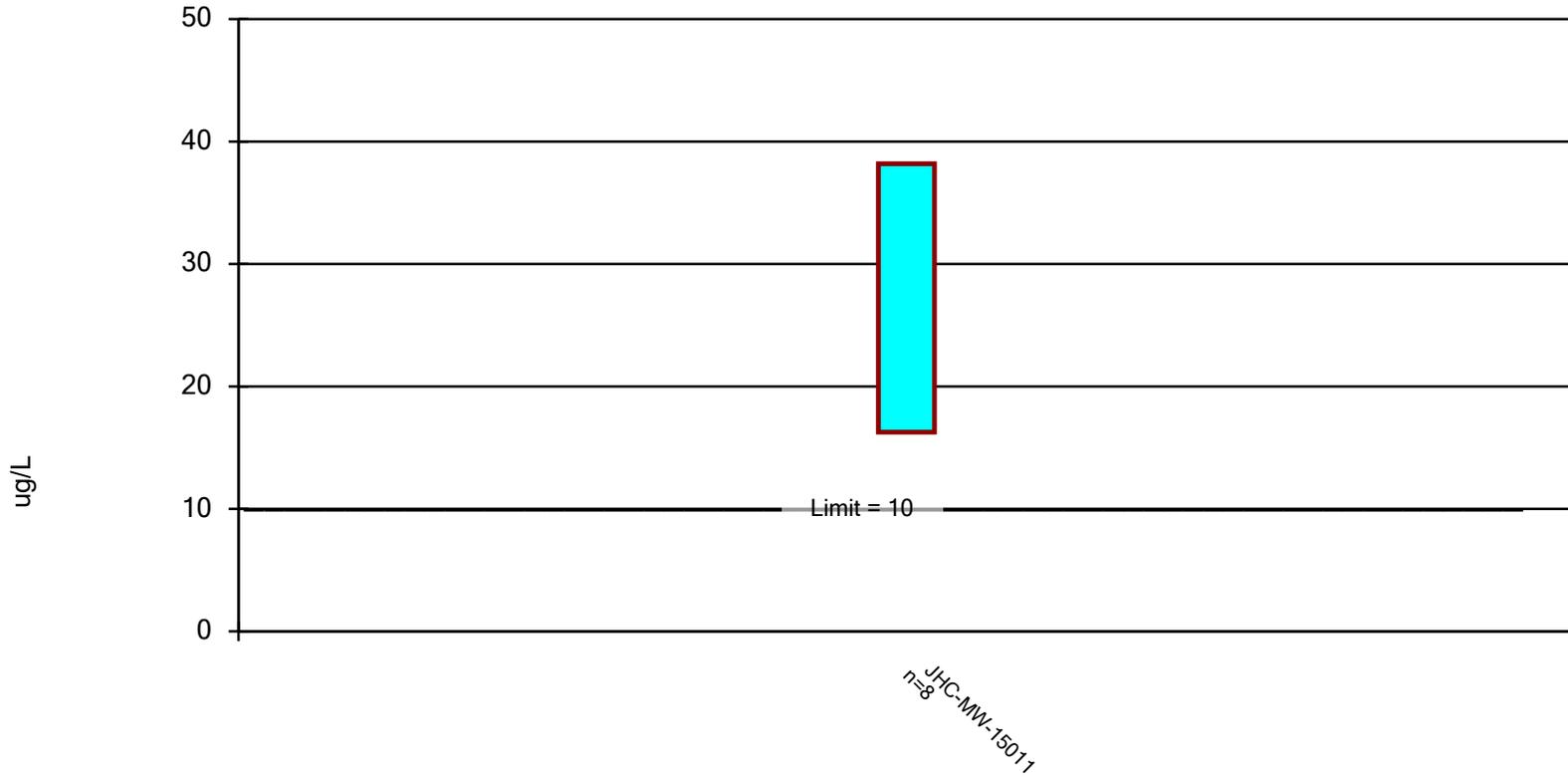
Client: Consumers Energy Data: JHC_Sanitas_20.05.28

JHC-MW-15011

8/15/2017	7.61
9/26/2017	7.48
6/19/2018	8.12
11/15/2018	9.11
4/23/2019	8.83
10/10/2019	8.37
2/12/2020	8
4/15/2020	7.63
Mean	8.144
Std. Dev.	0.5936
Upper Lim.	8.878
Lower Lim.	7.409

Parametric Confidence Interval

Compliance limit is exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Arsenic, Total Analysis Run 6/3/2020 9:39 AM
Client: Consumers Energy Data: JHC_Sanitas_20.05.28

Confidence Interval

Constituent: Arsenic, T Total (ug/L) Analysis Run 6/3/2020 9:40 AM

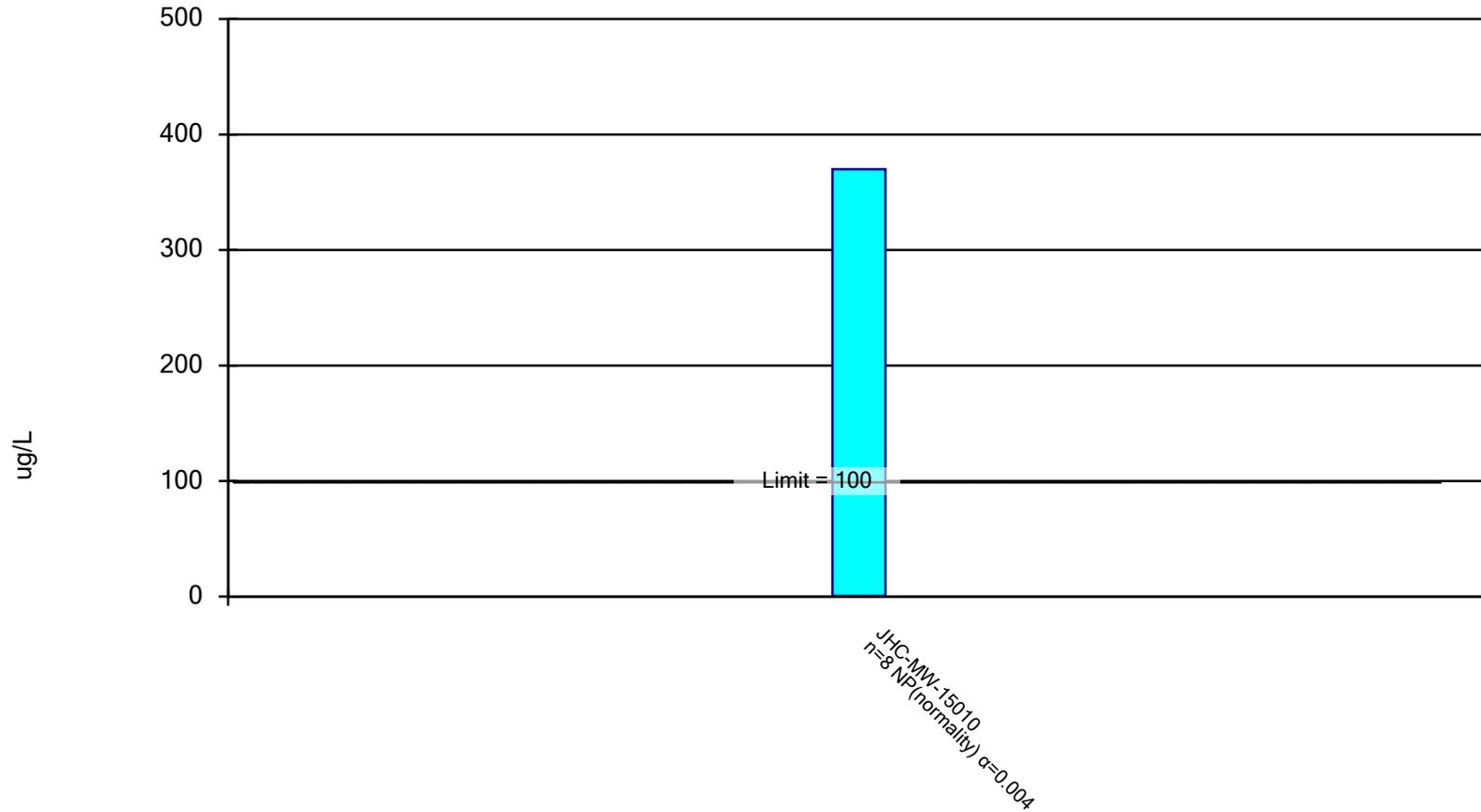
Client: Consumers Energy Data: JHC_Sanitas_20.05.28

JHC-MW-15011

8/15/2017	17.85 (D)
4/25/2018	16.8
6/19/2018	15
11/15/2018	32.2
4/23/2019	36
10/10/2019	44
2/12/2020	31
4/15/2020	25
Mean	27.23
Std. Dev.	10.34
Upper Lim.	38.19
Lower Lim.	16.27

Non-Parametric Confidence Interval

Compliance Limit is not exceeded.



Constituent: Chromium, Total Analysis Run 6/3/2020 9:40 AM

Client: Consumers Energy Data: JHC_Sanitas_20.05.28

Confidence Interval

Constituent: Chromium, Total (ug/L) Analysis Run 6/3/2020 9:41 AM

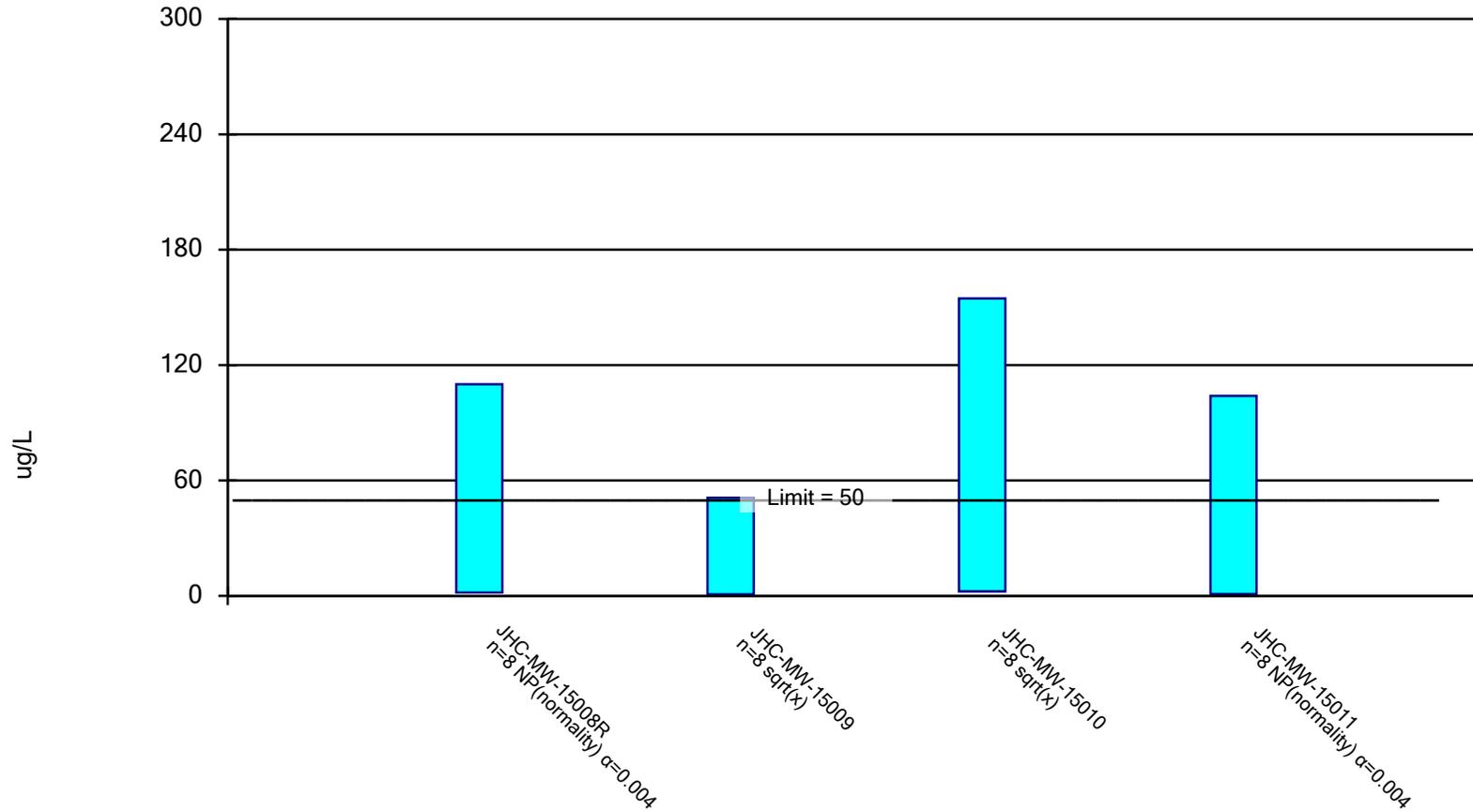
Client: Consumers Energy Data: JHC_Sanitas_20.05.28

JHC-MW-15010

8/15/2017	<1
4/26/2018	1.4
6/20/2018	1.1
11/14/2018	1.5
4/23/2019	1.2
10/9/2019	370
2/11/2020	4.5 (D)
4/14/2020	1
Mean	47.65
Std. Dev.	130.3
Upper Lim.	370
Lower Lim.	0.5

Parametric and Non-Parametric (NP) Confidence Interval

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



Constituent: Selenium, Total Analysis Run 6/3/2020 9:42 AM

Client: Consumers Energy Data: JHC_Sanitas_20.05.28

Confidence Interval

Constituent: Selenium, Total (ug/L) Analysis Run 6/3/2020 9:43 AM

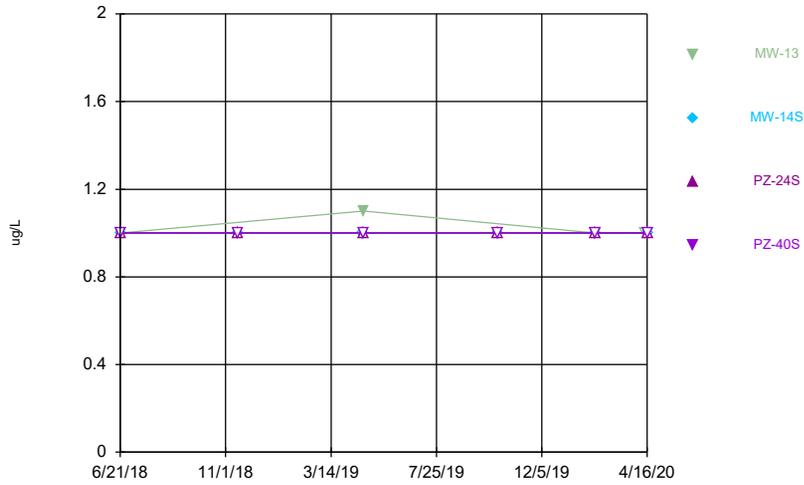
Client: Consumers Energy Data: JHC_Sanitas_20.05.28

	JHC-MW-15008R	JHC-MW-15009	JHC-MW-15010	JHC-MW-15011
6/21/2017	2.3	4.7		
8/15/2017	2.4	<1	<1	<1 (D)
4/25/2018				<1
4/26/2018	1.7	0.75 (D)	3	
6/19/2018				1.6
6/20/2018	2	10.3	11	
11/14/2018			34.1	
11/15/2018		12.6 (D)		<1
4/23/2019			32	13
4/24/2019		62 (D)		
8/13/2019	12			
10/9/2019	110 (D)		210	
10/10/2019				76
2/11/2020			126 (D)	
2/12/2020	11	20		104
4/14/2020	6	78 (D)	158	
4/15/2020				29
Mean	18.43	23.67	71.89	28.33
Std. Dev.	37.23	29.6	80.99	39.98
Upper Lim.	110	50.98	154.6	104
Lower Lim.	1.7	0.7268	2.32	1

Appendix C

GSI Time Series Charts

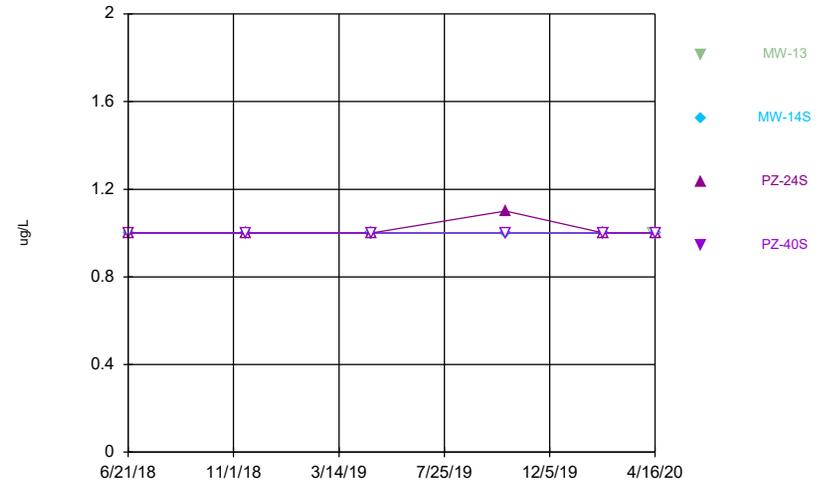
Antimony, Total



Time Series Analysis Run 6/3/2020 10:57 AM
Client: Consumers Energy Data: JHC_Sanitas_20.05.28

Insufficient amount of groundwater present in February and April 2020 to collect sample for total metals for MW-13. Reported February and April 2020 result is dissolved antimony result collected in accordance with the JH Campbell Dry Ash Landfill Hydrogeological Monitoring Plan (HMP).

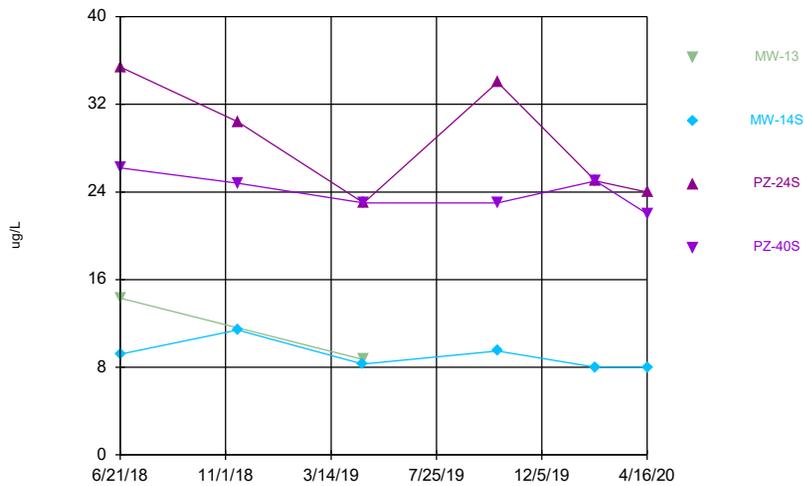
Arsenic, Total



Time Series Analysis Run 6/3/2020 10:57 AM
Client: Consumers Energy Data: JHC_Sanitas_20.05.28

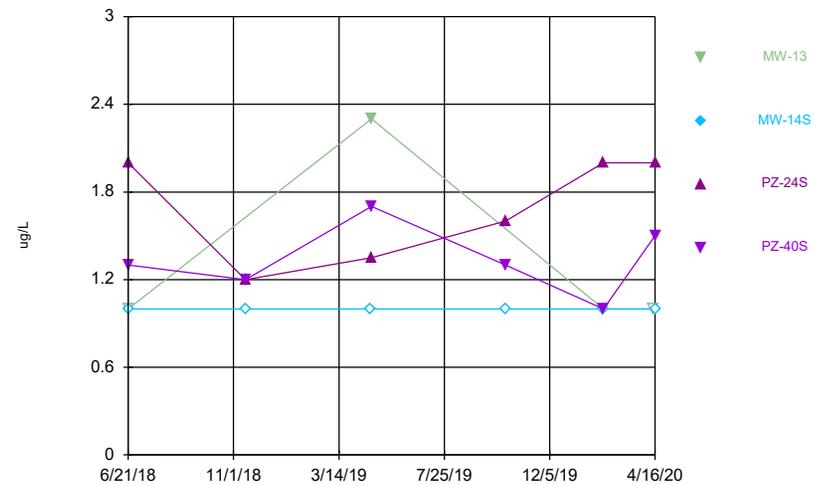
Insufficient amount of groundwater present in February and April 2020 to collect sample for total metals for MW-13. Reported February and April 2020 result is dissolved arsenic result collected in accordance with the JH Campbell Dry Ash Landfill Hydrogeological Monitoring Plan (HMP).

Barium, Total



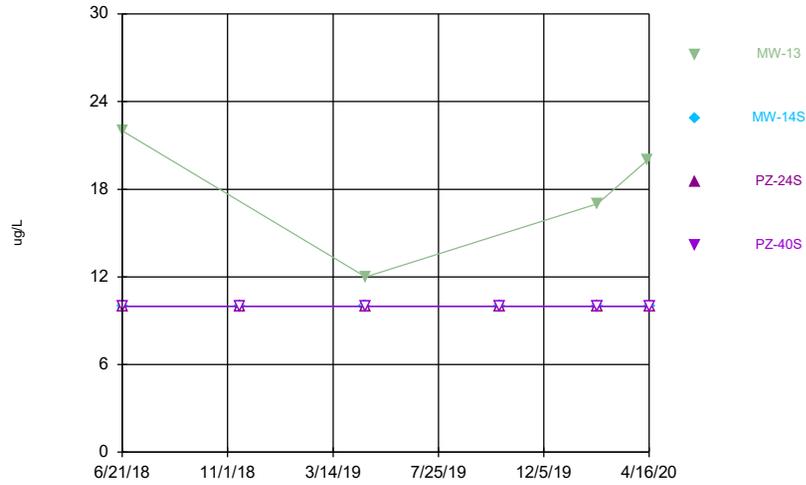
Time Series Analysis Run 6/3/2020 10:57 AM
Client: Consumers Energy Data: JHC_Sanitas_20.05.28

Chromium, Total



Insufficient amount of groundwater present in February and April 2020 to collect sample for total metals for MW-13. Reported February and April 2020 result is dissolved chromium result collected in accordance with the JH Campbell Dry Ash Landfill Hydrogeological Monitoring Plan (HMP).

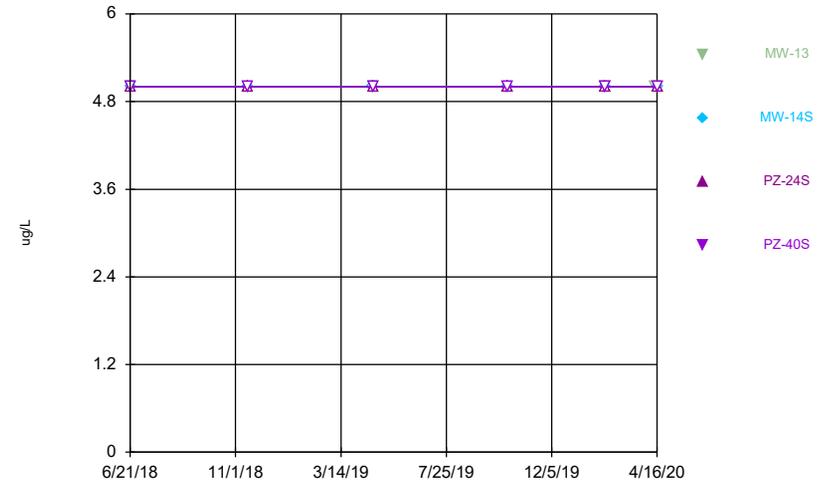
Lithium, Total



Time Series Analysis Run 6/3/2020 10:57 AM
Client: Consumers Energy Data: JHC_Sanitas_20.05.28

Insufficient amount of groundwater present in February and April 2020 to collect sample for total metals for MW-13. Reported February and April 2020 result is dissolved lithium result collected in accordance with the JH Campbell Dry Ash Landfill Hydrogeological Monitoring Plan (HMP).

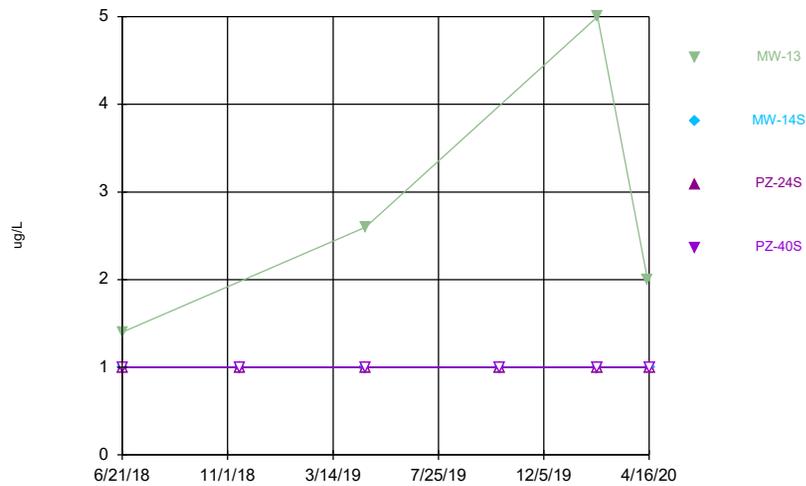
Molybdenum, Total



Time Series Analysis Run 6/3/2020 10:57 AM
Client: Consumers Energy Data: JHC_Sanitas_20.05.28

Insufficient amount of groundwater present in February and April 2020 to collect sample for total metals for MW-13. Reported February and April 2020 result is dissolved molybdenum result collected in accordance with the JH Campbell Dry Ash Landfill Hydrogeological Monitoring Plan (HMP).

Selenium, Total



Insufficient amount of groundwater present in February and April 2020 to collect sample for total metals for MW-13. Reported February and April 2020 result is dissolved selenium result collected in accordance with the JH Campbell Dry Ash Landfill Hydrogeological Monitoring Plan (HMP).

Appendix D

April 2020 Laboratory Reports

To: KDStarken, JH Campbell Complex

From: EBlaj, T-258

Date: May 05, 2020

Subject: JH CAMPBELL SOLID WASTE DISPOSAL AREA – GROUNDWATER MONITORING
2nd Quarter, 2020 – Background Wells

CC: BLSwanberg, P22-119
BTRunkel, P22-120
HDRegister, P22-521

Sarah Holmstrom, Project Manager
TRC Companies, Inc.
1540 Eisenhower Place
Ann Arbor, MI 48108

Chemistry Project: 20-0395

CE Laboratory Services conducted groundwater monitoring on 04/13/2020 through 04/16/2020 at the JH Campbell Solid Waste Disposal Area, for the 2nd Quarter monitoring requirements. The samples were received in the Chemistry department on 04/17/2020.

Samples for Radium analysis have been subcontracted to Eurofins/TestAmerica, Inc. and their results are being reported separately. Samples for Total Sulfide have been subcontracted to Merit Laboratories, Inc. The results are listed under the analyst initials “Merit” and the original report is attached. Please note that the subcontracted work is not reported under the CE laboratory scope of accreditation.

With the exception noted above, the report that follows presents the results of the requested analytical testing; the results apply only to the samples, as received. All samples have been analyzed in accordance with the 2009 TNI Standard and the applicable A2LA accreditation scope for Laboratory Services. Any exceptions to applicable test method criteria and standard compliance are noted in the Case Narrative, or flagged with applicable qualifiers in the analytical results section.

Reviewed and approved by:

Emil Blaj
Sr. Technical Analyst
Project Lead



Testing performed in accordance with the A2LA scope of accreditation specified in the listed certificate. The information contained in this report is the sole property of Consumers Energy. It cannot be reproduced except in full, and with consent from Consumers Energy, or the customer for which this report was issued.

CASE NARRATIVE

I. Sample Receipt

All samples were received within hold time and in good conditions; no anomalies were noted on the Sample Log-In Shipment Inspection Form during sample check-in. Identification of all samples included in the work order/project is provided in the sample summary section. Sample preservation upon receipt was verified by the sample custodian and confirmed to meet method requirements.

NOTE: Sample temperature measured upon receipt was found above the recommended range of 0-6°C. During the time samples were kept on the bench they warmed up to 6.1-8.2°C.

II. Methodology

Unless otherwise indicated, sample preparation and analysis was performed in accordance with the corresponding test methods from “Methods for the Determination of Inorganic Substances in Environmental Samples (EPA/600/R-93/100); SW-846, “Test Methods for Evaluating Solid Waste – Physical/Chemical Methods”, USEPA (latest revisions), and Standard Methods for the Examination of Water and Wastewater, APHA-AWWA-WPCF, 22nd Edition, 2012.

III. Results/Quality Control

Analytical results for this report are presented by laboratory sample ID, container & aliquot number. Results for the field blanks, field duplicates, and percent recoveries of the field matrix spike & matrix spike duplicate samples are included in the results section. Unless specifically noted in the case narrative, all method quality control requirements have been met. If any results are qualified, the corresponding data flags/qualifiers are listed on the last page of the results section. Any additional information on method performance, when applicable, is presented in this section of the case narrative. When data flags are not needed, the qualifiers text box on the last page is left blank, and a statement confirms that no exceptions occurred.

NOTE: Due to matrix interference / possible carry over effects the reporting limit for Silver has been increased for sample 20-0395-01; the results have been flagged (K).

DEFINITIONS / QUALIFIERS

The following qualifiers and/or acronyms are used in the report where applicable:

<u>Acronym</u>	<u>Description</u>
RL	Reporting Limit
ND	Result not detected or below Reporting Limit
NT	Not a TNI Analyte
LCS	Laboratory Control Sample
LRB	Laboratory Reagent Blank (also referred to as Method Blank)
DUP	Duplicate
MS	Matrix Spike
MSD	Matrix Spike Duplicate
RPD	Relative Percent Difference
MDL	Method Detection Limit
PQL	Practical Quantitation Limit

TDL Target Detection Limit
SM Standard Methods Compendium

<u>Qualifier</u>	<u>Description</u>
*	Generic data flag, applicable description added in the corresponding notes section
B	The analyte was detected in the LRB at a level which is significant relative to sample result
D	Reporting limit elevated due to dilution
E	Estimated due to result exceeding the linear range of the analyzer
H	The maximum recommended hold time was exceeded
I	Dilution required due to matrix interference; reporting limit elevated
J	Estimated due to result found above MDL but below PQL (or RL)
K	Reporting limit raised due to matrix interference
M	The precision for duplicate analysis was not met; RPD outside acceptance criteria
N	Non-homogeneous sample made analysis questionable
PI	Possible interference may have affected the accuracy of the laboratory result
Q	Matrix Spike or Matrix Spike Duplicate recovery outside acceptance criteria
R	Result confirmed by new sample preparation and reanalysis
X	Other notation required; comment listed in sample notes and/or case narrative

Customer Name: JH Campbell Complex
Work Order ID: Background Wells
Date Received: 4/17/2020
Chemistry Project: 20-0395

<u>Sample #</u>	<u>Field Sample ID</u>	<u>Matrix</u>	<u>Sample Date</u>	<u>Site</u>
20-0395-01	JHC-MW-15024	Groundwater	04/16/2020 10:44 AM	JHC RCRA GW Monitoring - Background Wells
20-0395-02	JHC-MW-15025	Groundwater	04/16/2020 11:58 AM	JHC RCRA GW Monitoring - Background Wells
20-0395-03	JHC-MW-15027	Groundwater	04/16/2020 02:35 PM	JHC RCRA GW Monitoring - Background Wells
20-0395-04	JHC-MW-15023	Groundwater	04/16/2020 09:29 AM	JHC RCRA GW Monitoring - Background Wells
20-0395-05	JHC-MW-15026	Groundwater	04/16/2020 01:16 PM	JHC RCRA GW Monitoring - Background Wells
20-0395-06	JHC-MW-15028	Groundwater	04/16/2020 02:30 PM	JHC RCRA GW Monitoring - Background Wells
20-0395-07	DUP-03	Groundwater	04/16/2020 12:00 AM	JHC RCRA GW Monitoring - Background Wells
20-0395-08	EB-03	Groundwater	04/16/2020 02:46 PM	JHC RCRA GW Monitoring - Background Wells
20-0395-09	FB-03	Groundwater	04/16/2020 10:30 AM	JHC RCRA GW Monitoring - Background Wells
20-0395-10	JHC-MW-15025 Field MS	Water	04/16/2020 11:58 AM	JHC RCRA GW Monitoring - Background Wells
20-0395-11	JHC-MW-15025 Field MSD	Water	04/16/2020 11:58 AM	JHC RCRA GW Monitoring - Background Wells

Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **JHC RCRA GW Monitoring - Background Wells (395496)**
 Field Sample ID: **JHC-MW-15024**
 Lab Sample ID: 20-0395-01
 Matrix: Groundwater

Laboratory Project: **20-0395**
 Collect Date: 04/16/2020
 Collect Time: 10:44 AM

Total Mercury by EPA 7470A, Aqueous

Aliquot: 20-0395-01-C02-A01

Analyst: TMR

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Mercury	ND		ug/L	0.2	04/21/2020	AB20-0421-01

Metals by EPA 6020B: CCR Rule Appendix III-IV Total Metals Expand

Aliquot: 20-0395-01-C02-A02

Analyst: SLK

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Antimony	ND		ug/L	1	04/27/2020	AB20-0427-04
Arsenic	ND		ug/L	1	04/27/2020	AB20-0427-04
Barium	18		ug/L	5	04/27/2020	AB20-0427-04
Beryllium	ND		ug/L	1	04/27/2020	AB20-0427-04
Boron	22		ug/L	20	04/27/2020	AB20-0427-04
Cadmium	ND		ug/L	0.2	04/27/2020	AB20-0427-04
Calcium	32800		ug/L	1000	04/28/2020	AB20-0427-04
Chromium	ND		ug/L	1	04/27/2020	AB20-0427-04
Cobalt	ND		ug/L	6	04/27/2020	AB20-0427-04
Copper	ND		ug/L	1	04/27/2020	AB20-0427-04
Iron	182		ug/L	20	04/28/2020	AB20-0427-04
Lead	ND		ug/L	1	04/27/2020	AB20-0427-04
Lithium	ND		ug/L	10	04/27/2020	AB20-0427-04
Magnesium	9630		ug/L	1000	04/28/2020	AB20-0427-04
Molybdenum	ND		ug/L	5	04/27/2020	AB20-0427-04
Nickel	ND		ug/L	2	04/27/2020	AB20-0427-04
Potassium	1010		ug/L	100	04/28/2020	AB20-0427-04
Selenium	ND		ug/L	1	04/27/2020	AB20-0427-04
Silver	ND	K	ug/L	0.3	04/27/2020	AB20-0427-04
Sodium	15700		ug/L	1000	04/28/2020	AB20-0427-04
Thallium	ND		ug/L	2	04/27/2020	AB20-0427-04
Vanadium	ND		ug/L	2	04/27/2020	AB20-0427-04
Zinc	ND		ug/L	10	04/27/2020	AB20-0427-04

Anions by EPA 300.0 Aqueous, NO2, NO3

Aliquot: 20-0395-01-C03-A01

Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Nitrate	750		ug/L	100	04/17/2020	AB20-0420-06
Nitrite	ND		ug/L	100	04/17/2020	AB20-0420-06

Anions by EPA 300.0 CCR Rule Analyte List, Cl, F, SO4, Aqueous

Aliquot: 20-0395-01-C03-A02

Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Chloride	20100		ug/L	1000	04/22/2020	AB20-0422-05
Fluoride	ND		ug/L	1000	04/22/2020	AB20-0422-05
Sulfate	6260		ug/L	2000	04/22/2020	AB20-0422-05



Analytical Report

Report Date: 05/05/20

Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **JHC RCRA GW Monitoring - Background Wells (395496)**
 Field Sample ID: **JHC-MW-15024**
 Lab Sample ID: 20-0395-01
 Matrix: Groundwater

Laboratory Project: **20-0395**
 Collect Date: 04/16/2020
 Collect Time: 10:44 AM

Total Dissolved Solids by SM 2540C

Aliquot: 20-0395-01-C04-A01 Analyst: DLR

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Total Dissolved Solids	158		mg/L	10	04/21/2020	AB20-0423-03

Alkalinity by SM 2320B

Aliquot: 20-0395-01-C07-A01 Analyst: BEK

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Alkalinity total	107000		ug/L	10000	04/17/2020	AB20-0423-15
Alkalinity bicarbonate	107000		ug/L	10000	04/17/2020	AB20-0423-15
Alkalinity carbonate	ND		ug/L	10000	04/17/2020	AB20-0423-15

Nitrogen-Ammonia by SM4500NH3(h), Groundwater HL

Aliquot: 20-0395-01-C09-A01 Analyst: BEK

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Ammonia	ND		ug/L	25	04/21/2020	AB20-0421-16

Sulfide, Total by SM 4500 S2D

Aliquot: 20-0395-01-C10-A01 Analyst: Merit

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Sulfide	ND		ug/L	40	04/20/2020	AB20-0429-12

Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **JHC RCRA GW Monitoring - Background Wells (395496)**
 Field Sample ID: **JHC-MW-15025**
 Lab Sample ID: 20-0395-02
 Matrix: Groundwater

Laboratory Project: **20-0395**
 Collect Date: 04/16/2020
 Collect Time: 11:58 AM

Total Mercury by EPA 7470A, Aqueous

Aliquot: 20-0395-02-C02-A01

Analyst: TMR

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Mercury	ND		ug/L	0.2	04/21/2020	AB20-0421-01

Metals by EPA 6020B: CCR Rule Appendix III-IV Total Metals Expand

Aliquot: 20-0395-02-C02-A02

Analyst: SLK

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Antimony	ND		ug/L	1	04/27/2020	AB20-0427-04
Arsenic	ND		ug/L	1	04/27/2020	AB20-0427-04
Barium	20		ug/L	5	04/27/2020	AB20-0427-04
Beryllium	ND		ug/L	1	04/27/2020	AB20-0427-04
Boron	26		ug/L	20	04/27/2020	AB20-0427-04
Cadmium	ND		ug/L	0.2	04/27/2020	AB20-0427-04
Calcium	16100		ug/L	1000	04/28/2020	AB20-0427-04
Chromium	ND		ug/L	1	04/27/2020	AB20-0427-04
Cobalt	ND		ug/L	6	04/27/2020	AB20-0427-04
Copper	ND		ug/L	1	04/27/2020	AB20-0427-04
Iron	33		ug/L	20	04/28/2020	AB20-0427-04
Lead	ND		ug/L	1	04/27/2020	AB20-0427-04
Lithium	ND		ug/L	10	04/27/2020	AB20-0427-04
Magnesium	4510		ug/L	1000	04/28/2020	AB20-0427-04
Molybdenum	ND		ug/L	5	04/27/2020	AB20-0427-04
Nickel	ND		ug/L	2	04/27/2020	AB20-0427-04
Potassium	751		ug/L	100	04/28/2020	AB20-0427-04
Selenium	ND		ug/L	1	04/27/2020	AB20-0427-04
Silver	ND		ug/L	0.2	04/27/2020	AB20-0427-04
Sodium	12900		ug/L	1000	04/28/2020	AB20-0427-04
Thallium	ND		ug/L	2	04/27/2020	AB20-0427-04
Vanadium	ND		ug/L	2	04/27/2020	AB20-0427-04
Zinc	ND		ug/L	10	04/27/2020	AB20-0427-04

Anions by EPA 300.0 Aqueous, NO2, NO3

Aliquot: 20-0395-02-C03-A01

Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Nitrate	930		ug/L	100	04/17/2020	AB20-0420-06
Nitrite	ND		ug/L	100	04/17/2020	AB20-0420-06

Anions by EPA 300.0 CCR Rule Analyte List, Cl, F, SO4, Aqueous

Aliquot: 20-0395-02-C03-A02

Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Chloride	15800		ug/L	1000	04/22/2020	AB20-0422-05
Fluoride	ND		ug/L	1000	04/22/2020	AB20-0422-05
Sulfate	8630		ug/L	2000	04/22/2020	AB20-0422-05

Laboratory Services
A CENTURY OF EXCELLENCE

Sample Site: **JHC RCRA GW Monitoring - Background Wells (395496)**
 Field Sample ID: **JHC-MW-15025**
 Lab Sample ID: 20-0395-02
 Matrix: Groundwater

Laboratory Project: **20-0395**
 Collect Date: 04/16/2020
 Collect Time: 11:58 AM

Total Dissolved Solids by SM 2540C

Aliquot: 20-0395-02-C04-A01 Analyst: DLR

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Total Dissolved Solids	98		mg/L	10	04/21/2020	AB20-0423-03

Alkalinity by SM 2320B

Aliquot: 20-0395-02-C07-A01 Analyst: BEK

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Alkalinity total	45900		ug/L	10000	04/17/2020	AB20-0423-15
Alkalinity bicarbonate	45900		ug/L	10000	04/17/2020	AB20-0423-15
Alkalinity carbonate	ND		ug/L	10000	04/17/2020	AB20-0423-15

Nitrogen-Ammonia by SM4500NH3(h), Groundwater HL

Aliquot: 20-0395-02-C09-A01 Analyst: BEK

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Ammonia	ND		ug/L	25	04/21/2020	AB20-0421-16

Sulfide, Total by SM 4500 S2D

Aliquot: 20-0395-02-C10-A01 Analyst: Merit

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Sulfide	ND		ug/L	40	04/20/2020	AB20-0429-12

Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **JHC RCRA GW Monitoring - Background Wells (395496)**
 Field Sample ID: **JHC-MW-15027**
 Lab Sample ID: 20-0395-03
 Matrix: Groundwater

Laboratory Project: **20-0395**
 Collect Date: 04/16/2020
 Collect Time: 02:35 PM

Total Mercury by EPA 7470A, Aqueous

Aliquot: 20-0395-03-C02-A01

Analyst: TMR

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Mercury	ND		ug/L	0.2	04/21/2020	AB20-0421-01

Metals by EPA 6020B: CCR Rule Appendix III-IV Total Metals Expand

Aliquot: 20-0395-03-C02-A02

Analyst: SLK

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Antimony	ND		ug/L	1	04/27/2020	AB20-0427-04
Arsenic	ND		ug/L	1	04/27/2020	AB20-0427-04
Barium	25		ug/L	5	04/27/2020	AB20-0427-04
Beryllium	ND		ug/L	1	04/27/2020	AB20-0427-04
Boron	ND		ug/L	20	04/27/2020	AB20-0427-04
Cadmium	ND		ug/L	0.2	04/27/2020	AB20-0427-04
Calcium	7780		ug/L	1000	04/28/2020	AB20-0427-04
Chromium	ND		ug/L	1	04/27/2020	AB20-0427-04
Cobalt	ND		ug/L	6	04/27/2020	AB20-0427-04
Copper	ND		ug/L	1	04/27/2020	AB20-0427-04
Iron	33		ug/L	20	04/28/2020	AB20-0427-04
Lead	ND		ug/L	1	04/27/2020	AB20-0427-04
Lithium	ND		ug/L	10	04/27/2020	AB20-0427-04
Magnesium	1860		ug/L	1000	04/28/2020	AB20-0427-04
Molybdenum	ND		ug/L	5	04/27/2020	AB20-0427-04
Nickel	ND		ug/L	2	04/27/2020	AB20-0427-04
Potassium	264		ug/L	100	04/28/2020	AB20-0427-04
Selenium	ND		ug/L	1	04/27/2020	AB20-0427-04
Silver	ND		ug/L	0.2	04/27/2020	AB20-0427-04
Sodium	2200		ug/L	1000	04/28/2020	AB20-0427-04
Thallium	ND		ug/L	2	04/27/2020	AB20-0427-04
Vanadium	ND		ug/L	2	04/27/2020	AB20-0427-04
Zinc	ND		ug/L	10	04/27/2020	AB20-0427-04

Anions by EPA 300.0 Aqueous, NO2, NO3

Aliquot: 20-0395-03-C03-A01

Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Nitrate	ND		ug/L	100	04/17/2020	AB20-0420-06
Nitrite	ND		ug/L	100	04/17/2020	AB20-0420-06

Anions by EPA 300.0 CCR Rule Analyte List, Cl, F, SO4, Aqueous

Aliquot: 20-0395-03-C03-A02

Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Chloride	ND		ug/L	1000	04/22/2020	AB20-0422-05
Fluoride	ND		ug/L	1000	04/22/2020	AB20-0422-05
Sulfate	7860		ug/L	2000	04/22/2020	AB20-0422-05



Analytical Report

Report Date: 05/05/20

Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **JHC RCRA GW Monitoring - Background Wells (395496)**
 Field Sample ID: **JHC-MW-15027**
 Lab Sample ID: 20-0395-03
 Matrix: Groundwater

Laboratory Project: **20-0395**
 Collect Date: 04/16/2020
 Collect Time: 02:35 PM

Total Dissolved Solids by SM 2540C

Aliquot: 20-0395-03-C04-A01 Analyst: DLR

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Total Dissolved Solids	37		mg/L	10	04/21/2020	AB20-0423-03

Alkalinity by SM 2320B

Aliquot: 20-0395-03-C07-A01 Analyst: BEK

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Alkalinity total	21400		ug/L	10000	04/17/2020	AB20-0423-15
Alkalinity bicarbonate	21400		ug/L	10000	04/17/2020	AB20-0423-15
Alkalinity carbonate	ND		ug/L	10000	04/17/2020	AB20-0423-15

Nitrogen-Ammonia by SM4500NH3(h), Groundwater HL

Aliquot: 20-0395-03-C09-A01 Analyst: BEK

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Ammonia	ND		ug/L	25	04/21/2020	AB20-0421-16

Sulfide, Total by SM 4500 S2D

Aliquot: 20-0395-03-C10-A01 Analyst: Merit

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Sulfide	ND		ug/L	40	04/20/2020	AB20-0429-12

Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **JHC RCRA GW Monitoring - Background Wells (395496)**
 Field Sample ID: **JHC-MW-15023**
 Lab Sample ID: 20-0395-04
 Matrix: Groundwater

Laboratory Project: **20-0395**
 Collect Date: 04/16/2020
 Collect Time: 09:29 AM

Total Mercury by EPA 7470A, Aqueous

Aliquot: 20-0395-04-C02-A01

Analyst: TMR

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Mercury	ND		ug/L	0.2	04/21/2020	AB20-0421-01

Metals by EPA 6020B: HMP-AMP Detection & Assessment Monitorin

Aliquot: 20-0395-04-C02-A02

Analyst: SLK

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Antimony	ND		ug/L	1	04/27/2020	AB20-0427-04
Arsenic	ND		ug/L	1	04/27/2020	AB20-0427-04
Barium	20		ug/L	5	04/27/2020	AB20-0427-04
Beryllium	ND		ug/L	1	04/27/2020	AB20-0427-04
Boron	45		ug/L	20	04/27/2020	AB20-0427-04
Cadmium	ND		ug/L	0.2	04/27/2020	AB20-0427-04
Calcium	9590		ug/L	1000	04/28/2020	AB20-0427-04
Chromium	ND		ug/L	1	04/27/2020	AB20-0427-04
Cobalt	ND		ug/L	15	04/27/2020	AB20-0427-04
Copper	ND		ug/L	1	04/27/2020	AB20-0427-04
Iron	38		ug/L	20	04/28/2020	AB20-0427-04
Lead	ND		ug/L	1	04/27/2020	AB20-0427-04
Lithium	ND		ug/L	10	04/27/2020	AB20-0427-04
Molybdenum	ND		ug/L	5	04/27/2020	AB20-0427-04
Nickel	ND		ug/L	1	04/27/2020	AB20-0427-04
Selenium	ND		ug/L	1	04/27/2020	AB20-0427-04
Silver	ND		ug/L	0.2	04/27/2020	AB20-0427-04
Thallium	ND		ug/L	2	04/27/2020	AB20-0427-04
Vanadium	ND		ug/L	2	04/27/2020	AB20-0427-04
Zinc	ND		ug/L	10	04/27/2020	AB20-0427-04

Anions by EPA 300.0 CCR Rule Analyte List, Cl, F, SO4, Aqueous

Aliquot: 20-0395-04-C03-A01

Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Chloride	1840		ug/L	1000	04/22/2020	AB20-0422-05
Fluoride	ND		ug/L	1000	04/22/2020	AB20-0422-05
Sulfate	9750		ug/L	2000	04/22/2020	AB20-0422-05

Total Dissolved Solids by SM 2540C

Aliquot: 20-0395-04-C04-A01

Analyst: DLR

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Total Dissolved Solids	56		mg/L	10	04/21/2020	AB20-0423-03

Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **JHC RCRA GW Monitoring - Background Wells (395496)**
 Field Sample ID: **JHC-MW-15026**
 Lab Sample ID: 20-0395-05
 Matrix: Groundwater

Laboratory Project: **20-0395**
 Collect Date: 04/16/2020
 Collect Time: 01:16 PM

Total Mercury by EPA 7470A, Aqueous

Aliquot: 20-0395-05-C02-A01

Analyst: TMR

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Mercury	ND		ug/L	0.2	04/21/2020	AB20-0421-01

Metals by EPA 6020B: HMP-AMP Detection & Assessment Monitorin

Aliquot: 20-0395-05-C02-A02

Analyst: SLK

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Antimony	ND		ug/L	1	04/27/2020	AB20-0427-04
Arsenic	ND		ug/L	1	04/27/2020	AB20-0427-04
Barium	15		ug/L	5	04/27/2020	AB20-0427-04
Beryllium	ND		ug/L	1	04/27/2020	AB20-0427-04
Boron	ND		ug/L	20	04/27/2020	AB20-0427-04
Cadmium	ND		ug/L	0.2	04/27/2020	AB20-0427-04
Calcium	16600		ug/L	1000	04/28/2020	AB20-0427-04
Chromium	ND		ug/L	1	04/27/2020	AB20-0427-04
Cobalt	ND		ug/L	15	04/27/2020	AB20-0427-04
Copper	ND		ug/L	1	04/27/2020	AB20-0427-04
Iron	25		ug/L	20	04/28/2020	AB20-0427-04
Lead	ND		ug/L	1	04/27/2020	AB20-0427-04
Lithium	ND		ug/L	10	04/27/2020	AB20-0427-04
Molybdenum	ND		ug/L	5	04/27/2020	AB20-0427-04
Nickel	ND		ug/L	1	04/27/2020	AB20-0427-04
Selenium	ND		ug/L	1	04/27/2020	AB20-0427-04
Silver	ND		ug/L	0.2	04/27/2020	AB20-0427-04
Thallium	ND		ug/L	2	04/27/2020	AB20-0427-04
Vanadium	ND		ug/L	2	04/27/2020	AB20-0427-04
Zinc	ND		ug/L	10	04/27/2020	AB20-0427-04

Anions by EPA 300.0 CCR Rule Analyte List, Cl, F, SO4, Aqueous

Aliquot: 20-0395-05-C03-A01

Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Chloride	7210		ug/L	1000	04/22/2020	AB20-0422-05
Fluoride	ND		ug/L	1000	04/22/2020	AB20-0422-05
Sulfate	6940		ug/L	2000	04/22/2020	AB20-0422-05

Total Dissolved Solids by SM 2540C

Aliquot: 20-0395-05-C04-A01

Analyst: DLR

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Total Dissolved Solids	76		mg/L	10	04/21/2020	AB20-0423-03

Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **JHC RCRA GW Monitoring - Background Wells (395496)**
 Field Sample ID: **JHC-MW-15028**
 Lab Sample ID: 20-0395-06
 Matrix: Groundwater

Laboratory Project: **20-0395**
 Collect Date: 04/16/2020
 Collect Time: 02:30 PM

Total Mercury by EPA 7470A, Aqueous

Aliquot: 20-0395-06-C02-A01

Analyst: TMR

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Mercury	ND		ug/L	0.2	04/21/2020	AB20-0421-01

Metals by EPA 6020B: HMP-AMP Detection & Assessment Monitorin

Aliquot: 20-0395-06-C02-A02

Analyst: SLK

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Antimony	ND		ug/L	1	04/27/2020	AB20-0427-04
Arsenic	ND		ug/L	1	04/27/2020	AB20-0427-04
Barium	14		ug/L	5	04/27/2020	AB20-0427-04
Beryllium	ND		ug/L	1	04/27/2020	AB20-0427-04
Boron	ND		ug/L	20	04/27/2020	AB20-0427-04
Cadmium	ND		ug/L	0.2	04/27/2020	AB20-0427-04
Calcium	11100		ug/L	1000	04/28/2020	AB20-0427-04
Chromium	ND		ug/L	1	04/27/2020	AB20-0427-04
Cobalt	ND		ug/L	15	04/27/2020	AB20-0427-04
Copper	ND		ug/L	1	04/27/2020	AB20-0427-04
Iron	29		ug/L	20	04/28/2020	AB20-0427-04
Lead	ND		ug/L	1	04/27/2020	AB20-0427-04
Lithium	ND		ug/L	10	04/27/2020	AB20-0427-04
Molybdenum	ND		ug/L	5	04/27/2020	AB20-0427-04
Nickel	ND		ug/L	1	04/27/2020	AB20-0427-04
Selenium	ND		ug/L	1	04/27/2020	AB20-0427-04
Silver	ND		ug/L	0.2	04/27/2020	AB20-0427-04
Thallium	ND		ug/L	2	04/27/2020	AB20-0427-04
Vanadium	ND		ug/L	2	04/27/2020	AB20-0427-04
Zinc	ND		ug/L	10	04/27/2020	AB20-0427-04

Anions by EPA 300.0 CCR Rule Analyte List, Cl, F, SO4, Aqueous

Aliquot: 20-0395-06-C03-A01

Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Chloride	ND		ug/L	1000	04/22/2020	AB20-0422-05
Fluoride	ND		ug/L	1000	04/22/2020	AB20-0422-05
Sulfate	5220		ug/L	2000	04/22/2020	AB20-0422-05

Total Dissolved Solids by SM 2540C

Aliquot: 20-0395-06-C04-A01

Analyst: DLR

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Total Dissolved Solids	42		mg/L	10	04/21/2020	AB20-0423-03



Analytical Report

Report Date: 05/05/20

Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **JHC RCRA GW Monitoring - Background Wells (395496)**
 Field Sample ID: **DUP-03**
 Lab Sample ID: 20-0395-07
 Matrix: Groundwater

Laboratory Project: **20-0395**
 Collect Date: 04/16/2020
 Collect Time: 12:00 AM

Total Mercury by EPA 7470A, Aqueous

Aliquot: 20-0395-07-C02-A01

Analyst: TMR

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Mercury	ND		ug/L	0.2	04/21/2020	AB20-0421-01

Metals by EPA 6020B: HMP-AMP Detection & Assessment Monitorin

Aliquot: 20-0395-07-C02-A02

Analyst: SLK

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Antimony	ND		ug/L	1	04/27/2020	AB20-0427-04
Arsenic	ND		ug/L	1	04/27/2020	AB20-0427-04
Barium	17		ug/L	5	04/27/2020	AB20-0427-04
Beryllium	ND		ug/L	1	04/27/2020	AB20-0427-04
Boron	41		ug/L	20	04/27/2020	AB20-0427-04
Cadmium	ND		ug/L	0.2	04/27/2020	AB20-0427-04
Calcium	8930		ug/L	1000	04/28/2020	AB20-0427-04
Chromium	ND		ug/L	1	04/27/2020	AB20-0427-04
Cobalt	ND		ug/L	15	04/27/2020	AB20-0427-04
Copper	ND		ug/L	1	04/27/2020	AB20-0427-04
Iron	41		ug/L	20	04/28/2020	AB20-0427-04
Lead	ND		ug/L	1	04/27/2020	AB20-0427-04
Lithium	ND		ug/L	10	04/27/2020	AB20-0427-04
Molybdenum	ND		ug/L	5	04/27/2020	AB20-0427-04
Nickel	ND		ug/L	1	04/27/2020	AB20-0427-04
Selenium	ND		ug/L	1	04/27/2020	AB20-0427-04
Silver	ND		ug/L	0.2	04/27/2020	AB20-0427-04
Thallium	ND		ug/L	2	04/27/2020	AB20-0427-04
Vanadium	ND		ug/L	2	04/27/2020	AB20-0427-04
Zinc	ND		ug/L	10	04/27/2020	AB20-0427-04

Anions by EPA 300.0 CCR Rule Analyte List, Cl, F, SO4, Aqueous

Aliquot: 20-0395-07-C03-A01

Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Chloride	2090		ug/L	1000	04/22/2020	AB20-0422-05
Fluoride	ND		ug/L	1000	04/22/2020	AB20-0422-05
Sulfate	10000		ug/L	2000	04/22/2020	AB20-0422-05

Total Dissolved Solids by SM 2540C

Aliquot: 20-0395-07-C04-A01

Analyst: DLR

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Total Dissolved Solids	49		mg/L	10	04/21/2020	AB20-0423-03



Analytical Report

Report Date: 05/05/20

Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **JHC RCRA GW Monitoring - Background Wells (395496)**
 Field Sample ID: **EB-03**
 Lab Sample ID: 20-0395-08
 Matrix: Groundwater

Laboratory Project: **20-0395**
 Collect Date: 04/16/2020
 Collect Time: 02:46 PM

Total Mercury by EPA 7470A, Aqueous

Aliquot: 20-0395-08-C02-A01

Analyst: TMR

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Mercury	ND		ug/L	0.2	04/21/2020	AB20-0421-01

Metals by EPA 6020B: HMP-AMP Detection & Assessment Monitorin

Aliquot: 20-0395-08-C02-A02

Analyst: SLK

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Antimony	ND		ug/L	1	04/27/2020	AB20-0427-04
Arsenic	ND		ug/L	1	04/27/2020	AB20-0427-04
Barium	ND		ug/L	5	04/27/2020	AB20-0427-04
Beryllium	ND		ug/L	1	04/27/2020	AB20-0427-04
Boron	ND		ug/L	20	04/27/2020	AB20-0427-04
Cadmium	ND		ug/L	0.2	04/27/2020	AB20-0427-04
Calcium	ND		ug/L	1000	04/28/2020	AB20-0427-04
Chromium	ND		ug/L	1	04/27/2020	AB20-0427-04
Cobalt	ND		ug/L	15	04/27/2020	AB20-0427-04
Copper	ND		ug/L	1	04/27/2020	AB20-0427-04
Iron	ND		ug/L	20	04/28/2020	AB20-0427-04
Lead	ND		ug/L	1	04/27/2020	AB20-0427-04
Lithium	ND		ug/L	10	04/27/2020	AB20-0427-04
Molybdenum	ND		ug/L	5	04/27/2020	AB20-0427-04
Nickel	ND		ug/L	1	04/27/2020	AB20-0427-04
Selenium	ND		ug/L	1	04/27/2020	AB20-0427-04
Silver	ND		ug/L	0.2	04/27/2020	AB20-0427-04
Thallium	ND		ug/L	2	04/27/2020	AB20-0427-04
Vanadium	ND		ug/L	2	04/27/2020	AB20-0427-04
Zinc	ND		ug/L	10	04/27/2020	AB20-0427-04

Anions by EPA 300.0 CCR Rule Analyte List, Cl, F, SO4, Aqueous

Aliquot: 20-0395-08-C03-A01

Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Chloride	ND		ug/L	1000	04/23/2020	AB20-0422-05
Fluoride	ND		ug/L	1000	04/23/2020	AB20-0422-05
Sulfate	ND		ug/L	2000	04/23/2020	AB20-0422-05

Total Dissolved Solids by SM 2540C

Aliquot: 20-0395-08-C04-A01

Analyst: DLR

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Total Dissolved Solids	ND		mg/L	10	04/21/2020	AB20-0423-03



Analytical Report

Report Date: 05/05/20

Laboratory Services A CENTURY OF EXCELLENCE

Sample Site: **JHC RCRA GW Monitoring - Background Wells (395496)**
Field Sample ID: **FB-03**
Lab Sample ID: 20-0395-09
Matrix: Groundwater

Laboratory Project: **20-0395**
Collect Date: 04/16/2020
Collect Time: 10:30 AM

Total Mercury by EPA 7470A, Aqueous

Aliquot: 20-0395-09-C02-A01

Analyst: TMR

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Mercury	ND		ug/L	0.2	04/21/2020	AB20-0421-01

Metals by EPA 6020B: HMP-AMP Detection & Assessment Monitorin

Aliquot: 20-0395-09-C02-A02

Analyst: SLK

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Antimony	ND		ug/L	1	04/27/2020	AB20-0427-04
Arsenic	ND		ug/L	1	04/27/2020	AB20-0427-04
Barium	ND		ug/L	5	04/27/2020	AB20-0427-04
Beryllium	ND		ug/L	1	04/27/2020	AB20-0427-04
Boron	ND		ug/L	20	04/27/2020	AB20-0427-04
Cadmium	ND		ug/L	0.2	04/27/2020	AB20-0427-04
Calcium	ND		ug/L	1000	04/28/2020	AB20-0427-04
Chromium	ND		ug/L	1	04/27/2020	AB20-0427-04
Cobalt	ND		ug/L	15	04/27/2020	AB20-0427-04
Copper	ND		ug/L	1	04/27/2020	AB20-0427-04
Iron	ND		ug/L	20	04/28/2020	AB20-0427-04
Lead	ND		ug/L	1	04/27/2020	AB20-0427-04
Lithium	ND		ug/L	10	04/27/2020	AB20-0427-04
Molybdenum	ND		ug/L	5	04/27/2020	AB20-0427-04
Nickel	ND		ug/L	1	04/27/2020	AB20-0427-04
Selenium	ND		ug/L	1	04/27/2020	AB20-0427-04
Silver	ND		ug/L	0.2	04/27/2020	AB20-0427-04
Thallium	ND		ug/L	2	04/27/2020	AB20-0427-04
Vanadium	ND		ug/L	2	04/27/2020	AB20-0427-04
Zinc	ND		ug/L	10	04/27/2020	AB20-0427-04

Anions by EPA 300.0 CCR Rule Analyte List, Cl, F, SO4, Aqueous

Aliquot: 20-0395-09-C03-A01

Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Chloride	ND		ug/L	1000	04/23/2020	AB20-0422-05
Fluoride	ND		ug/L	1000	04/23/2020	AB20-0422-05
Sulfate	ND		ug/L	2000	04/23/2020	AB20-0422-05

Total Dissolved Solids by SM 2540C

Aliquot: 20-0395-09-C04-A01

Analyst: DLR

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Total Dissolved Solids	ND		mg/L	10	04/21/2020	AB20-0423-03

Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **JHC RCRA GW Monitoring - Background Wells (395496)**
 Field Sample ID: **JHC-MW-15025 Field MS**
 Lab Sample ID: 20-0395-10
 Matrix: Groundwater

Laboratory Project: **20-0395**
 Collect Date: 04/16/2020
 Collect Time: 11:58 AM

Total Mercury by EPA 7470A, Aqueous

Aliquot: 20-0395-10-C02-A01

Analyst: TMR

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Mercury	104		%	0.2	04/21/2020	AB20-0421-01

Metals by EPA 6020B: HMP-AMP Detection & Assessment Monitorin

Aliquot: 20-0395-10-C02-A02

Analyst: SLK

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Antimony	106		%	1	04/27/2020	AB20-0427-04
Arsenic	105		%	1	04/27/2020	AB20-0427-04
Barium	107		%	5	04/27/2020	AB20-0427-04
Beryllium	110		%	1	04/27/2020	AB20-0427-04
Boron	106		%	20	04/27/2020	AB20-0427-04
Cadmium	108		%	0.2	04/27/2020	AB20-0427-04
Calcium	118		%	1000	04/28/2020	AB20-0427-04
Chromium	102		%	1	04/27/2020	AB20-0427-04
Cobalt	101		%	15	04/27/2020	AB20-0427-04
Copper	104		%	1	04/27/2020	AB20-0427-04
Iron	104		%	20	04/28/2020	AB20-0427-04
Lead	107		%	1	04/27/2020	AB20-0427-04
Lithium	110		%	10	04/27/2020	AB20-0427-04
Molybdenum	105		%	5	04/27/2020	AB20-0427-04
Nickel	103		%	1	04/27/2020	AB20-0427-04
Selenium	103		%	1	04/27/2020	AB20-0427-04
Silver	107		%	0.2	04/27/2020	AB20-0427-04
Thallium	104		%	2	04/27/2020	AB20-0427-04
Vanadium	105		%	2	04/27/2020	AB20-0427-04
Zinc	106		%	10	04/27/2020	AB20-0427-04

Anions by EPA 300.0 CCR Rule Analyte List, Cl, F, SO4, Aqueous

Aliquot: 20-0395-10-C03-A01

Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Chloride	97		%	1000	04/23/2020	AB20-0422-05
Fluoride	104		%	1000	04/23/2020	AB20-0422-05
Sulfate	106		%	2000	04/23/2020	AB20-0422-05

Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **JHC RCRA GW Monitoring - Background Wells (395496)**
 Field Sample ID: **JHC-MW-15025 Field MSD**
 Lab Sample ID: 20-0395-11
 Matrix: Groundwater

Laboratory Project: **20-0395**
 Collect Date: 04/16/2020
 Collect Time: 11:58 AM

Total Mercury by EPA 7470A, Aqueous

Aliquot: 20-0395-11-C02-A01

Analyst: TMR

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Mercury	113		%	0.2	04/21/2020	AB20-0421-01

Metals by EPA 6020B: HMP-AMP Detection & Assessment Monitorin

Aliquot: 20-0395-11-C02-A02

Analyst: SLK

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Antimony	108		%	1	04/27/2020	AB20-0427-04
Arsenic	105		%	1	04/27/2020	AB20-0427-04
Barium	106		%	5	04/27/2020	AB20-0427-04
Beryllium	108		%	1	04/27/2020	AB20-0427-04
Boron	104		%	20	04/27/2020	AB20-0427-04
Cadmium	106		%	0.2	04/27/2020	AB20-0427-04
Calcium	115		%	1000	04/28/2020	AB20-0427-04
Chromium	101		%	1	04/27/2020	AB20-0427-04
Cobalt	100		%	15	04/27/2020	AB20-0427-04
Copper	103		%	1	04/27/2020	AB20-0427-04
Iron	116		%	20	04/28/2020	AB20-0427-04
Lead	107		%	1	04/27/2020	AB20-0427-04
Lithium	107		%	10	04/27/2020	AB20-0427-04
Molybdenum	106		%	5	04/27/2020	AB20-0427-04
Nickel	103		%	1	04/27/2020	AB20-0427-04
Selenium	103		%	1	04/27/2020	AB20-0427-04
Silver	105		%	0.2	04/27/2020	AB20-0427-04
Thallium	104		%	2	04/27/2020	AB20-0427-04
Vanadium	104		%	2	04/27/2020	AB20-0427-04
Zinc	107		%	10	04/27/2020	AB20-0427-04

Anions by EPA 300.0 CCR Rule Analyte List, Cl, F, SO4, Aqueous

Aliquot: 20-0395-11-C03-A01

Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Chloride	98		%	1000	04/23/2020	AB20-0422-05
Fluoride	104		%	1000	04/23/2020	AB20-0422-05
Sulfate	107		%	2000	04/23/2020	AB20-0422-05

Data Qualifiers	Exception Summary
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K = RL increased due to matrix interference/possible carry over.

No other exceptions occurred.

TITLE: SAMPLE LOG-IN – SHIPMENT INSPECTION FORM

Project Log-In Number: 20-0395

Inspection Date: 04-17-2020 Inspection By: bel

Sample Origin/Project Name: JH CAMPBELL HMP / CLR

Shipment Delivered By: Enter the type of shipment carrier.

Pony _____ FedEx _____ UPS _____ USPS _____ Airborne _____

Other/Hand Carry (whom) CET DMW CLR

Tracking Number: _____ Shipping Form Attached: Yes _____ No _____

Shipping Containers: Enter the type and number of shipping containers received.

Cooler Cardboard Box _____ Custom Case _____ Envelope/Mailer _____

Loose/Unpackaged Containers _____ Other _____

Condition of Shipment: Enter the as-received condition of the shipment container.

Damaged Shipment Observed: None Dented _____ Leaking _____

Other _____

Shipment Security: Enter if any of the shipping containers were opened before receipt.

Shipping Containers Received: Opened _____ Sealed

Enclosed Documents: Enter the type of documents enclosed with the shipment.

CoC Work Request _____ Air Data Sheet _____ Other _____

Temperature of Containers: Measure the temperature of several sample containers.

As-Received Temperature 6.1-8.3°C Samples Received on Ice: Yes _____ No

Number and Type of Containers: Enter the total number of sample containers received.

Container Type	Water	Soil	Other	Broken	Leaking
VOA (40mL or 60mL)	<u>6</u>	_____	_____	_____	_____
Quart/Liter (g/p)	_____	_____	_____	_____	_____
9-oz (amber glass jar)	_____	_____	_____	_____	_____
2-oz (amber glass)	_____	_____	_____	_____	_____
125 mL (plastic)	<u>28</u>	_____	_____	_____	_____
24 mL vial (glass)	_____	_____	_____	_____	_____
500 mL (plastic)	<u>9</u>	_____	_____	_____	_____
Other	_____	_____	_____	_____	_____

041720
250
28

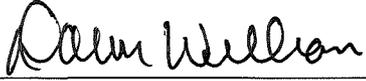
PH VERIFIED < 2 ON 04-17-20 by bel

CHAIN OF CUSTODY

CONSUMERS ENERGY COMPANY – LABORATORY SERVICES



135 WEST TRAIL ST., JACKSON, MI 49201 • (517) 788-1251 • FAX (517) 788-2533

SAMPLING SITE JHC 2 nd Qtr. 2020 RCRA GW Monitoring Background Wells				PROJECT NUMBER 20-0395			ANALYSIS REQUESTED							PAGE <u>1</u> OF <u>1</u>			
SAMPLING TEAM CET / CLH / DMW				DATE SHIPPED		SITE SKETCHED ATTACHED? CIRCLE ONE NO		Metals, Total	Anions	TDS	Radium	Alkalinity	Ammonia	Sulfide	Nitrates	SEND REPORT TO Kevin Starken	
																Beth Swanberg, TRC	
CE CONTROL #	SAMPLE DATE	SAMPLE TIME	SAMPLE MATRIX	SAMPLE DESCRIPTION / LOCATION	DEPTH	# OF CONTAINERS										REMARKS	
20-0395-01	4/16/20	1044	GW	JHC-MW-15024	--	9	X	X	X	X	X	X	X	X	X	Nitrates / Sulfide	
-02		1158	GW	JHC-MW-15025	--	9	X	X	X	X	X	X	X	X	X	Nitrates / Sulfide	
-03		1435	GW	JHC-MW-15027	--	9	X	X	X	X	X	X	X	X	X	Nitrates / Sulfide	
-04		0929	GW	JHC-MW-15023	--	5	X	X	X	X							
-05		1316	GW	JHC-MW-15026	--	5	X	X	X	X							
-06		1430	GW	JHC-MW-15028	--	5	X	X	X	X							
-07		—	GW	DUP-03	--	5	X	X	X	X							
-08		1446	GW	EB-03	--	5	X	X	X	X							
-09		1030	GW	FB-03	--	5	X	X	X	X							
-10		1158	GW	JHC-MW-15025 Field MS	--	2	X	X									
-11			GW	JHC-MW-15025 Field MSD	--	2	X	X									
RELINQUISHED BY (SIGNATURE) 				DATE/TIME 4.17.20 0915		RECEIVED BY (SIGNATURE) 				COMMENTS Total Metals = HMP-AMP Metals and Mercury 5.8 - 04172015 6.1 → 8.2 °C							
RELINQUISHED BY (SIGNATURE)				DATE/TIME		RECEIVED BY (SIGNATURE)				ORIGINAL TO LAB COPY TO CUSTOMER							



Analytical Laboratory Report

Report ID: S13359.01(01)
Generated on 04/20/2020

Report to

Attention: Emil Blaj
Consumers Energy Company
135 West Trail Street
Jackson, MI 49201

Phone: D:517-788-5888 C:517-684-9467 FAX: 517-788-2533
Email: emil.blaj@cmsenergy.com

Report produced by

Merit Laboratories, Inc.
2680 East Lansing Drive
East Lansing, MI 48823

Phone: (517) 332-0167 FAX: (517) 332-6333

Contacts for report questions:
John Lavery (johnlavery@meritlabs.com)
Barbara Ball (bball@meritlabs.com)

Report Summary

Lab Sample ID(s): S13359.01-S13359.09
Project: JHC GW Monitoring Q2
Collected Date(s): 04/15/2020 - 04/16/2020
Submitted Date/Time: 04/17/2020 16:40
Sampled by: CET / CLH / DHW
P.O. #: 4400088825

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- Glossary of Abbreviations (Page 3)
- Method Summary (Page 4)
- Sample Summary (Page 5)

Maya Murshak
Technical Director



Analytical Laboratory Report

General Report Notes

Analytical results relate only to the samples tested, in the condition received by the laboratory.

Methods may be modified for improved performance.

Results reported on a dry weight basis where applicable.

'Not detected' indicates that parameter was not found at a level equal to or greater than the reporting limit (RL).

40 CFR Part 136 Table II Required Containers, Preservation Techniques and Holding Times for the Clean Water Act specify that samples for acrolein and acrylonitrile need to be preserved at a pH in the range of 4 to 5 or if not preserved, analyzed within 3 days of sampling.

QA/QC corresponding to this analytical report is a separate document with the same Merit ID reference and is available upon request.

Full accreditation certificates are available upon request. Starred (*) analytes are not NELAP accredited.

Samples are held by the lab for 30 days from the final report date unless a written request to hold longer is provided by the client.

Report shall not be reproduced except in full, without the written approval of Merit Laboratories, Inc.

Limits for drinking water samples, are listed as the MCL Limits (Maximum Contaminant Level Concentrations)

Report Narrative

There is no additional narrative for this analytical report



Analytical Laboratory Report

Laboratory Certifications

Authority	Certification ID
Michigan DEQ	#9956
DOD ELAP/ISO 17025	#69699
WBENC	#2005110032
Ohio VAP	#CL0002
Indiana DOH	#C-MI-07
New York NELAC	#11814
North Carolina DENR	#680
North Carolina DOH	#26702
Alaska CSLAP	#17-001

Qualifier Descriptions

Qualifier	Description
!	Result is outside of stated limit criteria
B	Compound also found in associated method blank
E	Concentration exceeds calibration range
F	Analysis run outside of holding time
G	Estimated result due to extraction run outside of holding time
H	Sample submitted and run outside of holding time
I	Matrix interference with internal standard
J	Estimated value less than reporting limit, but greater than MDL
L	Elevated reporting limit due to low sample amount
M	Result reported to MDL not RDL
O	Analysis performed by outside laboratory. See attached report.
R	Preliminary result
S	Surrogate recovery outside of control limits
T	No correction for total solids
X	Elevated reporting limit due to matrix interference
Y	Elevated reporting limit due to high target concentration
b	Value detected less than reporting limit, but greater than MDL
e	Reported value estimated due to interference
j	Analyte also found in associated method blank
p	Benzo(b)Fluoranthene and Benzo(k)Fluoranthene integrated as one peak.
x	Preserved from bulk sample

Glossary of Abbreviations

Abbreviation	Description
RL/RDL	Reporting Limit
MDL	Method Detection Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
SW	EPA SW 846 (Soil and Wastewater) Methods
E	EPA Methods
SM	Standard Methods
LN	Linear
BR	Branched



Analytical Laboratory Report

Method Summary

Method	Version
SM4500-S2 D	Standard Method 4450 S2 D 2011



Analytical Laboratory Report

Sample Summary (9 samples)

Sample ID	Sample Tag	Matrix	Collected Date/Time
S13359.01	20-0384-06 JHC-MW-15011	Groundwater	04/15/20 09:36
S13359.02	20-0395-01 JHC-MW-15024	Groundwater	04/16/20 10:44
S13359.03	20-0395-02 JHC-MW-15025	Groundwater	04/16/20 11:58
S13359.04	20-0395-03 JHC-MW-15027	Groundwater	04/16/20 14:35
S13359.05	20-0398-01 JHC-MW-15013	Groundwater	04/16/20 12:58
S13359.06	20-0398-02 JHC-MW-15015	Groundwater	04/16/20 10:16
S13359.07	20-0397-01 JHC-MW-15002	Groundwater	04/16/20 17:23
S13359.08	20-0397-02 JHC-MW-15005	Groundwater	04/16/20 18:11
S13359.09	20-0397-03 JHC-MW-18005	Groundwater	04/16/20 17:01



Analytical Laboratory Report

Lab Sample ID: S13359.01

Sample Tag: 20-0384-06 JHC-MW-15011

Collected Date/Time: 04/15/2020 09:36

Matrix: Groundwater

COC Reference: 134191

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
1	125ml Plastic	NaOH	Yes	5.3	IR

Inorganics

Method: SM4500-S2 D, Run Date: 04/20/20 13:22, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Sulfide	Not detected	0.04	0.010	mg/L	2	18496-25-8	



Analytical Laboratory Report

Lab Sample ID: S13359.02

Sample Tag: 20-0395-01 JHC-MW-15024

Collected Date/Time: 04/16/2020 10:44

Matrix: Groundwater

COC Reference: 134191

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
1	125ml Plastic	NaOH	Yes	5.3	IR

Inorganics

Method: SM4500-S2 D, Run Date: 04/20/20 13:24, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Sulfide	Not detected	0.04	0.010	mg/L	2	18496-25-8	



Analytical Laboratory Report

Lab Sample ID: S13359.03

Sample Tag: 20-0395-02 JHC-MW-15025

Collected Date/Time: 04/16/2020 11:58

Matrix: Groundwater

COC Reference: 134191

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
1	125ml Plastic	NaOH	Yes	5.3	IR

Inorganics

Method: SM4500-S2 D, Run Date: 04/20/20 13:26, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Sulfide	Not detected	0.04	0.010	mg/L	2	18496-25-8	



Analytical Laboratory Report

Lab Sample ID: S13359.04

Sample Tag: 20-0395-03 JHC-MW-15027

Collected Date/Time: 04/16/2020 14:35

Matrix: Groundwater

COC Reference: 134191

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
1	125ml Plastic	NaOH	Yes	5.3	IR

Inorganics

Method: SM4500-S2 D, Run Date: 04/20/20 13:28, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Sulfide	Not detected	0.04	0.010	mg/L	2	18496-25-8	



Analytical Laboratory Report

Lab Sample ID: S13359.05

Sample Tag: 20-0398-01 JHC-MW-15013

Collected Date/Time: 04/16/2020 12:58

Matrix: Groundwater

COC Reference: 134191

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
1	125ml Plastic	NaOH	Yes	5.3	IR

Inorganics

Method: SM4500-S2 D, Run Date: 04/20/20 13:30, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Sulfide	Not detected	0.04	0.010	mg/L	2	18496-25-8	



Analytical Laboratory Report

Lab Sample ID: S13359.06

Sample Tag: 20-0398-02 JHC-MW-15015

Collected Date/Time: 04/16/2020 10:16

Matrix: Groundwater

COC Reference: 134191

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
1	125ml Plastic	NaOH	Yes	5.3	IR

Inorganics

Method: SM4500-S2 D, Run Date: 04/20/20 13:34, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Sulfide	0.14	0.04	0.010	mg/L	2	18496-25-8	



Analytical Laboratory Report

Lab Sample ID: S13359.07

Sample Tag: 20-0397-01 JHC-MW-15002

Collected Date/Time: 04/16/2020 17:23

Matrix: Groundwater

COC Reference: 134191

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
1	125ml Plastic	NaOH	Yes	5.3	IR

Inorganics

Method: SM4500-S2 D, Run Date: 04/20/20 13:36, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Sulfide	0.06	0.04	0.010	mg/L	2	18496-25-8	



Analytical Laboratory Report

Lab Sample ID: S13359.08

Sample Tag: 20-0397-02 JHC-MW-15005

Collected Date/Time: 04/16/2020 18:11

Matrix: Groundwater

COC Reference: 134191

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
1	125ml Plastic	NaOH	Yes	5.3	IR

Inorganics

Method: SM4500-S2 D, Run Date: 04/20/20 13:38, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Sulfide	Not detected	0.04	0.010	mg/L	2	18496-25-8	



Analytical Laboratory Report

Lab Sample ID: S13359.09

Sample Tag: 20-0397-03 JHC-MW-18005

Collected Date/Time: 04/16/2020 17:01

Matrix: Groundwater

COC Reference: 134191

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
1	125ml Plastic	NaOH	Yes	5.3	IR

Inorganics

Method: SM4500-S2 D, Run Date: 04/20/20 13:40, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Sulfide	Not detected	0.04	0.010	mg/L	2	18496-25-8	

Merit Laboratories Login Checklist

Lab Set ID:S13359

Attention: Emil Blaj
Address: Consumers Energy Company
135 West Trail Street
Jackson, MI 49201

Client:CONSUMERS (Consumers Energy)

Project: JHC GW Monitoring Q2

Submitted:04/17/2020 16:40 Login User: MMC

Phone: D:517-788-5888 FAX:517-788-2533
Email:emil.blaj@cmsenergy.com

Selection	Description	Note
-----------	-------------	------

Sample Receiving

- | | | |
|-----|--|--|
| 01. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Samples are received at 4C +/- 2C Thermometer # IR 5.3 |
| 02. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Received on ice/ cooling process begun |
| 03. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Samples shipped |
| 04. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Samples left in 24 hr. drop box |
| 05. | <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A | Are there custody seals/tape or is the drop box locked |

Chain of Custody

- | | | |
|-----|--|--|
| 06. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | COC adequately filled out |
| 07. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | COC signed and relinquished to the lab |
| 08. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Sample tag on bottles match COC |
| 09. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Subcontracting needed? Subcontracted to: |

Preservation

- | | | |
|-----|--|---|
| 10. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Do sample have correct chemical preservation |
| 11. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Completed pH checks on preserved samples? (no VOAs) |
| 12. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Did any samples need to be preserved in the lab? |

Bottle Conditions

- | | | |
|-----|--|---|
| 13. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | All bottles intact |
| 14. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Appropriate analytical bottles are used |
| 15. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Merit bottles used |
| 16. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Sufficient sample volume received |
| 17. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Samples require laboratory filtration |
| 18. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Samples submitted within holding time |
| 19. | <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A | Do water VOC or TOX bottles contain headspace |

Corrective action for all exceptions is to call the client and to notify the project manager.

Client Review By: _____ Date: _____

Merit Laboratories Bottle Preservation Check

Lab Set ID: S13359 Initials: MMC

Client: CONSUMERS (Consumers Energy)

Project: JHC GW Monitoring Q2

Submitted: 04/17/2020 16:40 Login User:

Attention: Emil Blaj
 Address: Consumers Energy Company
 135 West Trail Street
 Jackson, MI 49201

Phone: D:517-788-5888 FAX: 517-788-2533
 Email: emil.blaj@cmsenergy.com

Lab ID	125 ml Plastic HNO ₃	250 ml Plastic HNO ₃	1 L Plastic HNO ₃	250 ml Plastic H ₂ SO ₄	125 ml Amber H ₂ SO ₄	32 oz Glass HCl	125 ml Plastic NaOH	125 ml Amber PbCO ₃ NaOH	pH					Notes	
									<2	>12	other	ml add	new pH		
S13359.01							X			X					
S13359.02							X			X					
S13359.03							X			X					
S13359.04							X			X					
S13359.05							X			X					
S13359.06							X			X					
S13359.07							X			X					
S13359.08							X			X					
S13359.09							X			X					



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 Phone (517) 332-0167 Fax (517) 332-4034
 www.meritlabs.com

C.O.C. PAGE # 1 OF 1

134191

REPORT TO

CHAIN OF CUSTODY RECORD

INVOICE TO

CONTACT NAME: **EMIL BLAJ**
 COMPANY: **CONSUMERS ENERGY**
 ADDRESS: **135 W. TRAIL STREET**
 CITY: **JACKSON** STATE: **MI** ZIP CODE: **49201**
 PHONE NO.: **517-788-5888** FAX NO.: P.O. NO.: **4400088825**
 E-MAIL ADDRESS: **Emil.Blaj@cmsenergy.com** QUOTE NO.:

CONTACT NAME: SAME
 COMPANY:
 ADDRESS:
 CITY: STATE: ZIP CODE:
 PHONE NO.: E-MAIL ADDRESS:

PROJECT NO./NAME: **JHC GW Monitoring Q2** SAMPLER(S) - PLEASE PRINT/SIGN NAME:
 TURNAROUND TIME REQUIRED: 1 DAY 2 DAYS 3 DAYS STANDARD OTHER
 DELIVERABLES REQUIRED: STD LEVEL II LEVEL III LEVEL IV EDD OTHER

MATRIX: GW=GROUNDWATER WW=WASTEWATER S=SOIL L=LIQUID SD=SOLID
 CODE: SL=SLUDGE DW=DRINKING WATER O=OIL WP=WIPE A=AIR W=WASTE

Containers & Preservatives

Total sulfate

Certifications
 OHIO VAP Drinking Water
 DoD NPDES
 Project Locations
 Detroit New York
 Other
 Special Instructions

MERIT LAB NO. <small>FOR LAB USE ONLY</small>	YEAR		SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	# Containers & Preservatives								Total sulfate	
	DATE	TIME				NONE	HCl	HNO ₃	H ₂ SO ₄	NaOH	MeOH	OTHER			
13359.01	4-15-20	0936	20-0384-06 JHC-MW-15011	GW	1									X	✓
.02	4-16-20	1044	20-0395-01		1									X	✓
.03		1158	-02		1									X	✓
.04		1435	-03		1									X	✓
.05		1258	20-0398-01		1									X	✓
.06		1016	-02		1									X	✓
.07		1723	20-0397-01		1									X	✓
.08		1811	-02		1									X	✓
.09		1701	-03		1									X	✓

RELINQUISHED BY: *je Consumers Energy* Sampler DATE: **04-17-20** TIME: **1600**
 RECEIVED BY: *M Chalko* DATE: **4/17/2020** TIME: **1640**

RELINQUISHED BY: DATE: TIME:
 RECEIVED BY: DATE: TIME:
 SEAL NO. SEAL INTACT YES NO INITIALS
 SEAL NO. SEAL INTACT YES NO INITIALS
 NOTES: TEMP. ON ARRIVAL **5.3**

PLEASE NOTE: SIGNING ACKNOWLEDGES ADHERENCE TO MERIT'S SAMPLE ACCEPTANCE POLICY ON REVERSE SIDE

ANALYTICAL REPORT

Eurofins TestAmerica, St. Louis
13715 Rider Trail North
Earth City, MO 63045
Tel: (314)298-8566

Laboratory Job ID: 160-37918-1
Client Project/Site: JH Campbell Background Wells

For:
Consumers Energy
135 W Trail Street
Jackson, Michigan 49201

Attn: Emil Blaj



Authorized for release by:
6/3/2020 11:37:30 PM

Jayna Awalt, Project Manager II
(314)298-8566
jayna.awalt@testamericainc.com

LINKS

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results through
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www.eurofinsus.com/Env

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.



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Case Narrative

Client: Consumers Energy
Project/Site: JH Campbell Background Wells

Job ID: 160-37918-1

Job ID: 160-37918-1

Laboratory: Eurofins TestAmerica, St. Louis

Narrative

CASE NARRATIVE

Client: Consumers Energy

Project: JH Campbell Background Wells

Report Number: 160-37918-1

With the exceptions noted as flags or footnotes, standard analytical protocols were followed in the analysis of the samples and no problems were encountered or anomalies observed. In addition all laboratory quality control samples were within established control limits, with any exceptions noted below. Each sample was analyzed to achieve the lowest possible reporting limit within the constraints of the method. In some cases, due to interference or analytes present at high concentrations, samples were diluted. For diluted samples, the reporting limits are adjusted relative to the dilution required.

Eurofins TestAmerica, St. Louis attests to the validity of the laboratory data generated by Eurofins TestAmerica facilities reported herein. All analyses performed by Eurofins TestAmerica facilities were done using established laboratory SOPs that incorporate QA/QC procedures described in the application methods. Eurofins TestAmerica's operations groups have reviewed the data for compliance with the laboratory QA/QC plan, and data have been found to be compliant with laboratory protocols unless otherwise noted below.

The test results in this report meet all NELAP requirements for parameters for which accreditation is required or available. Any exceptions to NELAP requirements are noted in this report. Pursuant to NELAP, this report may not be reproduced, except in full, without the written approval of the laboratory.

Calculations are performed before rounding to avoid round-off errors in calculated results.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the individual sections below.

All solid sample results for Chemistry analyses are reported on an "as received" basis unless otherwise indicated by the presence of a % solids value in the method header. All soil/sediment sample results for radiochemistry analyses are based upon sample as dried and disaggregated with the exception of tritium, carbon-14, and iodine-129 by gamma spectroscopy unless requested as wet weight by the client."

Any minimum detectable concentration (MDC), critical value (DLC), or Safe Drinking Water Act detection limit (SDWA DL) is sample-specific unless otherwise stated elsewhere in this narrative.

Reference the chain of custody and condition upon receipt report for any variations on receipt conditions and temperature of samples on receipt.

Manual Integrations were performed only when necessary and are in compliance with the laboratory's standard operating procedure. Detailed information can be found in the raw data section of the level IV report.

This laboratory report is confidential and is intended for the sole use of Eurofins TestAmerica and its client.

RECEIPT

The samples were received on 4/29/2020 9:21 AM; the samples arrived in good condition, properly preserved. The temperatures of the 6 coolers at receipt time were 19.1°C, 19.3°C, 19.7°C, 20.1°C, 20.5°C and 21.3°C

RADIUM 226 AS TOTAL ALPHA RADIUM

Samples JHC-MW-15024 (160-37918-1), JHC-MW-15025 (160-37918-2), JHC-MW-15027 (160-37918-3), JHC-MW-15023 (160-37918-4), JHC-MW-15026 (160-37918-5), JHC-MW-15028 (160-37918-6), DUP-03 (160-37918-7), EB-03 (160-37918-8) and FB-03 (160-37918-9)

Case Narrative

Client: Consumers Energy
Project/Site: JH Campbell Background Wells

Job ID: 160-37918-1

Job ID: 160-37918-1 (Continued)

Laboratory: Eurofins TestAmerica, St. Louis (Continued)

were analyzed for Radium 226 as Total Alpha Radium in accordance with EPA 903.0_Total Alpha Radium. The samples were prepared on 05/12/2020 and analyzed on 05/21/2020.

Radium-226 Prep Batch 160-470052Ra-226 is reported without a 21-day waiting period to ensure short-lived alpha-emitting radium isotopes (e.g. Ra-224) have decayed out. The Ra-226 result should be considered to be potentially high biased. Associated samples have activity below the RL. The results are reported with this narrative. JHC-MW-15024 (160-37918-1), JHC-MW-15025 (160-37918-2), JHC-MW-15027 (160-37918-3), JHC-MW-15023 (160-37918-4), JHC-MW-15026 (160-37918-5), JHC-MW-15028 (160-37918-6), DUP-03 (160-37918-7), EB-03 (160-37918-8), FB-03 (160-37918-9), (LCS 160-470052/1-A), (LCSD 160-470052/2-A) and (MB 160-470052/12-A)

Insufficient sample volume was available to perform a sample duplicate for the following samples: JHC-MW-15024 (160-37918-1), JHC-MW-15025 (160-37918-2), JHC-MW-15027 (160-37918-3), JHC-MW-15023 (160-37918-4), JHC-MW-15026 (160-37918-5), JHC-MW-15028 (160-37918-6), DUP-03 (160-37918-7), EB-03 (160-37918-8) and FB-03 (160-37918-9). A laboratory control sample/ laboratory control sample duplicate (LCS/LCSD) were prepared instead to demonstrate batch precision.

The Ba carrier recovery is outside the lower control limit (40%) for the following samples: JHC-MW-15025 (160-37918-2) and JHC-MW-15027 (160-37918-3). The samples produced a small pellet following barium sulfate precipitation. The samples were seeded with 3 additional drops of Barium carrier, but this did not yield a better result. Matrix interference is suspected.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

RADIUM-228 (GFPC)

Samples JHC-MW-15024 (160-37918-1), JHC-MW-15025 (160-37918-2), JHC-MW-15027 (160-37918-3), JHC-MW-15023 (160-37918-4), JHC-MW-15026 (160-37918-5), JHC-MW-15028 (160-37918-6), DUP-03 (160-37918-7), EB-03 (160-37918-8) and FB-03 (160-37918-9) were analyzed for Radium-228 (GFPC) in accordance with EPA 904. The samples were prepared on 05/21/2020 and analyzed on 06/01/2020.

The laboratory control sample duplicate recovery (LCSD, 24%) was outside the lower limit (75%). The RER was also outside the upper limit; however, the laboratory control sample and method blank (LCS; MB) passed. There was not enough volume for re-extract. The data has been reported with this narrative. JHC-MW-15024 (160-37918-1), JHC-MW-15025 (160-37918-2), JHC-MW-15027 (160-37918-3), JHC-MW-15023 (160-37918-4), JHC-MW-15026 (160-37918-5), JHC-MW-15028 (160-37918-6), DUP-03 (160-37918-7), EB-03 (160-37918-8), FB-03 (160-37918-9), (LCS 160-471099/1-A), (LCSD 160-471099/2-A) and (MB 160-471099/13-A)

The barium carrier recovery is outside the lower control limit (40%) for the following samples: JHC-MW-15025 (160-37918-2), JHC-MW-15027 (160-37918-3) and (LCSD 160-471099/2-A). There was physical evidence of matrix interference apparent during the initial preparation of the sample. There is insufficient volume remaining for analysis.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

COMBINED RADIUM-226 AND RADIUM-228

Samples JHC-MW-15024 (160-37918-1), JHC-MW-15025 (160-37918-2), JHC-MW-15027 (160-37918-3), JHC-MW-15023 (160-37918-4), JHC-MW-15026 (160-37918-5), JHC-MW-15028 (160-37918-6), DUP-03 (160-37918-7), EB-03 (160-37918-8) and FB-03 (160-37918-9) were analyzed for Combined Radium-226 and Radium-228 in accordance with EPA 903 Radium 226/EPA 904 Radium 228. The samples were analyzed on 06/02/2020.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Chain of Custody Record



Environment Testing
TestAmerica

Regulatory Program: DW NPDES RCRA Other:

Client Contact Consumers Energy, Laboratory Services 135 W. Trail Street Jackson, MI 49201 517-788-5888 (xxx) xxx-xxxx FAX Project Name: JH Campbell Background Wells 20-0395 P.O.#		Project Manager: Emil Blaj Email: Emil.Blaj@cmsenergy.com Tel/Fax: 517-788-5888 Analysis Turnaround Time <input checked="" type="checkbox"/> CALENDAR DAYS <input type="checkbox"/> WORKING DAYS TAT if different from Below _____ <input type="checkbox"/> 2 weeks <input checked="" type="checkbox"/> 1 week <input type="checkbox"/> 2 days <input type="checkbox"/> 1 day		Site Contact: Bethany Swanberg Date: _____ Carrier: _____ Lab Contact: Emil Blaj COC No: 1 of 1 COCs Sampler: CLH/DMW/CET For Lab Use Only: Walk-in Client: Lab Sampling: Job / SDG No.:					
Sample Identification		Perform MS / MSD (Y / N) Preservative		Radium 226 (EPA 903.1) Radium 228 (EPA 904.0)					
JHC-MW-15024	4/16/20	1044	G	GW	2	N	X		
JHC-MW-15025	4/16/20	1158	G	GW	2	N	X		
JHC-MW-15027	4/16/20	1435	G	GW	2	N	X		
JHC-MW-15023	4/16/20	0929	G	GW	2	N	X		
JHC-MW-15026	4/16/20	1316	G	GW	2	N	X		
JHC-MW-15028	4/15/20	1430	G	GW	2	N	X		
DUP-03	4/16/20	--	G	GW	2	N	X		
EB-03	4/16/20	1446	G	DI	2	N	X		
FB-03	4/16/20	1030	G	DI	2	N	X		
Preservation Used: 1 = Ice, 2 = HCl; 3 = H2SO4; 4 = HNO3; 5 = NaOH; 6 = Other Possible Hazard Identification: Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample. <input checked="" type="checkbox"/> Non-Hazard <input type="checkbox"/> Flammable <input type="checkbox"/> Skin Irritant <input type="checkbox"/> Poison B <input type="checkbox"/> Unknown									
Special Instructions/QC Requirements & Comments: Custy Seal No.: _____ Relinquished by: <i>Campbell-Hansen</i> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Relinquished by: <i>UPS</i> Relinquished by:									
Sample Disposal (A fee may be assessed if samples are retained longer than 1 month) <input type="checkbox"/> Return to Client <input checked="" type="checkbox"/> Disposal by Lab <input type="checkbox"/> Archive for _____ Months Cooler Temp. (°C): Obs'd: _____ Corrd: _____ Therm ID No.: _____ Received by: <i>VPS</i> Company: _____ Date/Time: _____ Received by: <i>Emil Blaj</i> Company: <i>EPA STC</i> Date/Time: <i>4/19/2020 0921</i> Received in Laboratory by: _____ Company: _____ Date/Time: _____									



TestAmerica Michigan
10448 Citation Drive; Ste 200
Brighton, MI 48116

PROCUREMENT #: 20040554

QA Code: NQ

(Item 1) - Part Number: N/A - Quantity : 1
JHC CCR Rule GW Q2-2020 Samples

Groundwater Samples for Radium 226 (EPA 903.1) and Radium 228 (EPA 904.0)

Standard TAT Request.

Reference Quote #16009066-0

(Item 2) - Part Number: NA - Quantity : 1

Please include Consumers Energy Project Number and Procurement Number on all submitted invoices

For technical questions, please contact Emil Blaj at 517-788-5888, or Emil.Blaj@cmsenergy.com.

To expedite payment please provide the Procurement number on all invoices.

Send Invoices To:

Consumers Energy Company
Attn: Accounts Payable
135 W Trail St.
Jackson, MI 49201



Login Sample Receipt Checklist

Client: Consumers Energy

Job Number: 160-37918-1

SDG Number:

Login Number: 37918

List Source: Eurofins TestAmerica, St. Louis

List Number: 1

Creator: Lambert-Sykes, Chenise Y

Question	Answer	Comment
Radioactivity wasn't checked or is \leq background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	N/A	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <math><6\text{mm}</math> (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Definitions/Glossary

Client: Consumers Energy
Project/Site: JH Campbell Background Wells

Job ID: 160-37918-1

Qualifiers

Rad

Qualifier	Qualifier Description
*	LCS or LCSD is outside acceptance limits.
*	RPD of the LCS and LCSD exceeds the control limits
G	The Sample MDC is greater than the requested RL.
U	Result is less than the sample detection limit.
X	Carrier is outside acceptance limits.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
α	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Method Summary

Client: Consumers Energy
Project/Site: JH Campbell Background Wells

Job ID: 160-37918-1

Method	Method Description	Protocol	Laboratory
903.0	Radium-226 (GFPC)	EPA	TAL SL
904.0	Radium-228 (GFPC)	EPA	TAL SL
Ra226_Ra228	Combined Radium-226 and Radium-228	TAL-STL	TAL SL
PrecSep STD	Preparation, Precipitate Separation (Standard In-Growth)	None	TAL SL
PrecSep_0	Preparation, Precipitate Separation	None	TAL SL

Protocol References:

- EPA = US Environmental Protection Agency
- None = None
- TAL-STL = TestAmerica Laboratories, St. Louis, Facility Standard Operating Procedure.

Laboratory References:

- TAL SL = Eurofins TestAmerica, St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566



Sample Summary

Client: Consumers Energy
Project/Site: JH Campbell Background Wells

Job ID: 160-37918-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received	Asset ID
160-37918-1	JHC-MW-15024	Water	04/16/20 10:44	04/29/20 09:21	
160-37918-2	JHC-MW-15025	Water	04/16/20 11:58	04/29/20 09:21	
160-37918-3	JHC-MW-15027	Water	04/16/20 14:35	04/29/20 09:21	
160-37918-4	JHC-MW-15023	Water	04/16/20 09:29	04/29/20 09:21	
160-37918-5	JHC-MW-15026	Water	04/16/20 13:16	04/29/20 09:21	
160-37918-6	JHC-MW-15028	Water	04/15/20 14:30	04/29/20 09:21	
160-37918-7	DUP-03	Water	04/16/20 00:00	04/29/20 09:21	
160-37918-8	EB-03	Water	04/16/20 14:46	04/29/20 09:21	
160-37918-9	FB-03	Water	04/16/20 10:30	04/29/20 09:21	

Client Sample Results

Client: Consumers Energy
Project/Site: JH Campbell Background Wells

Job ID: 160-37918-1

Client Sample ID: JHC-MW-15024

Lab Sample ID: 160-37918-1

Date Collected: 04/16/20 10:44

Matrix: Water

Date Received: 04/29/20 09:21

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.00140	U	0.110	0.110	1.00	0.222	pCi/L	05/12/20 06:58	05/21/20 11:48	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	91.8		40 - 110					05/12/20 06:58	05/21/20 11:48	1

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.263	U *	0.425	0.426	1.00	0.717	pCi/L	05/21/20 13:15	06/01/20 08:29	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	65.6		40 - 110					05/21/20 13:15	06/01/20 08:29	1
Y Carrier	87.1		40 - 110					05/21/20 13:15	06/01/20 08:29	1

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.264	U	0.439	0.440	5.00	0.717	pCi/L		06/02/20 13:55	1

Client Sample ID: JHC-MW-15025

Lab Sample ID: 160-37918-2

Date Collected: 04/16/20 11:58

Matrix: Water

Date Received: 04/29/20 09:21

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.0395	U	0.146	0.147	1.00	0.280	pCi/L	05/12/20 06:58	05/21/20 11:48	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	64.2		40 - 110					05/12/20 06:58	05/21/20 11:48	1

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.555	U * G	1.11	1.11	1.00	1.90	pCi/L	05/21/20 13:15	06/01/20 08:29	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	25.8	X	40 - 110					05/21/20 13:15	06/01/20 08:29	1
Y Carrier	83.7		40 - 110					05/21/20 13:15	06/01/20 08:29	1

Client Sample Results

Client: Consumers Energy
Project/Site: JH Campbell Background Wells

Job ID: 160-37918-1

Client Sample ID: JHC-MW-15025

Lab Sample ID: 160-37918-2

Date Collected: 04/16/20 11:58

Matrix: Water

Date Received: 04/29/20 09:21

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.594	U	1.12	1.12	5.00	1.90	pCi/L		06/02/20 13:55	1

Client Sample ID: JHC-MW-15027

Lab Sample ID: 160-37918-3

Date Collected: 04/16/20 14:35

Matrix: Water

Date Received: 04/29/20 09:21

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.0908	U	0.112	0.112	1.00	0.184	pCi/L	05/12/20 06:58	05/21/20 11:48	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	95.9		40 - 110					05/12/20 06:58	05/21/20 11:48	1

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.598	U * G	0.818	0.820	1.00	1.37	pCi/L	05/21/20 13:15	06/01/20 08:29	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	34.7	X	40 - 110					05/21/20 13:15	06/01/20 08:29	1
Y Carrier	86.7		40 - 110					05/21/20 13:15	06/01/20 08:29	1

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.689	U	0.826	0.828	5.00	1.37	pCi/L		06/02/20 13:55	1

Client Sample ID: JHC-MW-15023

Lab Sample ID: 160-37918-4

Date Collected: 04/16/20 09:29

Matrix: Water

Date Received: 04/29/20 09:21

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.0346	U	0.0873	0.0874	1.00	0.165	pCi/L	05/12/20 06:58	05/21/20 11:49	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	95.6		40 - 110					05/12/20 06:58	05/21/20 11:49	1

Client Sample Results

Client: Consumers Energy
Project/Site: JH Campbell Background Wells

Job ID: 160-37918-1

Client Sample ID: JHC-MW-15023

Lab Sample ID: 160-37918-4

Date Collected: 04/16/20 09:29

Matrix: Water

Date Received: 04/29/20 09:21

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	-0.0104	U *	0.353	0.353	1.00	0.634	pCi/L	05/21/20 13:15	06/01/20 08:30	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	75.7		40 - 110					05/21/20 13:15	06/01/20 08:30	1
Y Carrier	89.3		40 - 110					05/21/20 13:15	06/01/20 08:30	1

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.0242	U	0.364	0.364	5.00	0.634	pCi/L		06/02/20 13:55	1

Client Sample ID: JHC-MW-15026

Lab Sample ID: 160-37918-5

Date Collected: 04/16/20 13:16

Matrix: Water

Date Received: 04/29/20 09:21

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	-0.0254	U	0.0519	0.0519	1.00	0.139	pCi/L	05/12/20 06:58	05/21/20 11:49	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	107		40 - 110					05/12/20 06:58	05/21/20 11:49	1

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.176	U *	0.394	0.394	1.00	0.676	pCi/L	05/21/20 13:15	06/01/20 08:30	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	79.8		40 - 110					05/21/20 13:15	06/01/20 08:30	1
Y Carrier	79.3		40 - 110					05/21/20 13:15	06/01/20 08:30	1

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.150	U	0.397	0.397	5.00	0.676	pCi/L		06/02/20 13:55	1

Client Sample Results

Client: Consumers Energy
Project/Site: JH Campbell Background Wells

Job ID: 160-37918-1

Client Sample ID: JHC-MW-15028

Lab Sample ID: 160-37918-6

Date Collected: 04/15/20 14:30

Matrix: Water

Date Received: 04/29/20 09:21

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.0562	U	0.144	0.145	1.00	0.262	pCi/L	05/12/20 06:58	05/21/20 11:49	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	90.9		40 - 110					05/12/20 06:58	05/21/20 11:49	1

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	-0.220	U *	0.342	0.343	1.00	0.651	pCi/L	05/21/20 13:15	06/01/20 08:30	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	76.9		40 - 110					05/21/20 13:15	06/01/20 08:30	1
Y Carrier	87.1		40 - 110					05/21/20 13:15	06/01/20 08:30	1

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	-0.164	U	0.371	0.372	5.00	0.651	pCi/L		06/02/20 13:55	1

Client Sample ID: DUP-03

Lab Sample ID: 160-37918-7

Date Collected: 04/16/20 00:00

Matrix: Water

Date Received: 04/29/20 09:21

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.0957	U	0.103	0.104	1.00	0.164	pCi/L	05/12/20 06:58	05/21/20 11:49	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	96.9		40 - 110					05/12/20 06:58	05/21/20 11:49	1

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	-0.0794	U *	0.303	0.303	1.00	0.560	pCi/L	05/21/20 13:15	06/01/20 08:30	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	81.0		40 - 110					05/21/20 13:15	06/01/20 08:30	1
Y Carrier	90.5		40 - 110					05/21/20 13:15	06/01/20 08:30	1

Client Sample Results

Client: Consumers Energy
Project/Site: JH Campbell Background Wells

Job ID: 160-37918-1

Client Sample ID: DUP-03

Lab Sample ID: 160-37918-7

Date Collected: 04/16/20 00:00

Matrix: Water

Date Received: 04/29/20 09:21

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.0163	U	0.320	0.320	5.00	0.560	pCi/L		06/02/20 13:55	1

Client Sample ID: EB-03

Lab Sample ID: 160-37918-8

Date Collected: 04/16/20 14:46

Matrix: Water

Date Received: 04/29/20 09:21

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	-0.0239	U	0.107	0.107	1.00	0.235	pCi/L	05/12/20 06:58	05/21/20 11:49	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	82.7		40 - 110					05/12/20 06:58	05/21/20 11:49	1

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.340	U *	0.339	0.341	1.00	0.551	pCi/L	05/21/20 13:15	06/01/20 08:30	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	80.7		40 - 110					05/21/20 13:15	06/01/20 08:30	1
Y Carrier	91.6		40 - 110					05/21/20 13:15	06/01/20 08:30	1

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.316	U	0.355	0.357	5.00	0.551	pCi/L		06/02/20 13:55	1

Client Sample ID: FB-03

Lab Sample ID: 160-37918-9

Date Collected: 04/16/20 10:30

Matrix: Water

Date Received: 04/29/20 09:21

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	-0.0736	U	0.0954	0.0956	1.00	0.240	pCi/L	05/12/20 06:58	05/21/20 11:49	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	82.7		40 - 110					05/12/20 06:58	05/21/20 11:49	1

Client Sample Results

Client: Consumers Energy
 Project/Site: JH Campbell Background Wells

Job ID: 160-37918-1

Client Sample ID: FB-03

Lab Sample ID: 160-37918-9

Date Collected: 04/16/20 10:30

Matrix: Water

Date Received: 04/29/20 09:21

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.175	U *	0.307	0.307	1.00	0.520	pCi/L	05/21/20 13:15	06/01/20 08:30	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	89.0		40 - 110					05/21/20 13:15	06/01/20 08:30	1
Y Carrier	92.3		40 - 110					05/21/20 13:15	06/01/20 08:30	1

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.101	U	0.321	0.322	5.00	0.520	pCi/L		06/02/20 13:55	1

QC Sample Results

Client: Consumers Energy
Project/Site: JH Campbell Background Wells

Job ID: 160-37918-1

Method: 903.0 - Radium-226 (GFPC)

Lab Sample ID: MB 160-470052/12-A
Matrix: Water
Analysis Batch: 471038

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 470052

Analyte	MB MB		Count	Total	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
	Result	Qualifier	Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Radium-226	-0.06774	U	0.0617	0.0620	1.00	0.177	pCi/L	05/12/20 06:58	05/21/20 11:49	1
Carrier	MB MB		Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	%Yield	Qualifier	40 - 110					05/12/20 06:58	05/21/20 11:49	1
	101									

Lab Sample ID: LCS 160-470052/1-A
Matrix: Water
Analysis Batch: 471038

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 470052

Analyte	Spike Added	LCS Result	LCS Qual	Total	RL	MDC	Unit	%Rec	%Rec. Limits
				Uncert. (2σ+/-)					
Radium-226	11.3	10.19		1.22	1.00	0.244	pCi/L	90	75 - 125
Carrier	LCS %Yield	LCS Qualifier	Limits						
Ba Carrier	78.0		40 - 110						

Lab Sample ID: LCSD 160-470052/2-A
Matrix: Water
Analysis Batch: 471038

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 470052

Analyte	Spike Added	LCSD Result	LCSD Qual	Total	RL	MDC	Unit	%Rec	%Rec. Limits	RER	RER
				Uncert. (2σ+/-)							Limit
Radium-226	11.3	9.811		1.14	1.00	0.198	pCi/L	86	75 - 125	0.16	1
Carrier	LCSD %Yield	LCSD Qualifier	Limits								
Ba Carrier	94.7		40 - 110								

Method: 904.0 - Radium-228 (GFPC)

Lab Sample ID: MB 160-471099/13-A
Matrix: Water
Analysis Batch: 471606

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 471099

Analyte	MB MB		Count	Total	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
	Result	Qualifier	Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Radium-228	0.2247	U	0.281	0.282	1.00	0.466	pCi/L	05/21/20 13:15	06/01/20 08:30	1
Carrier	MB MB		Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	%Yield	Qualifier	40 - 110					05/21/20 13:15	06/01/20 08:30	1
Y Carrier	92.3		40 - 110					05/21/20 13:15	06/01/20 08:30	1
	90.5									

QC Sample Results

Client: Consumers Energy
 Project/Site: JH Campbell Background Wells

Job ID: 160-37918-1

Method: 904.0 - Radium-228 (GFPC) (Continued)

Lab Sample ID: LCS 160-471099/1-A
Matrix: Water
Analysis Batch: 471606

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 471099

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits
Radium-228	11.7	12.39		1.50	1.00	0.631	pCi/L	106	75 - 125

Carrier	LCS %Yield	LCS Qualifier	Limits
Ba Carrier	80.7		40 - 110
Y Carrier	86.4		40 - 110

Lab Sample ID: LCSD 160-471099/2-A
Matrix: Water
Analysis Batch: 471606

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 471099

Analyte	Spike Added	LCSD Result	LCSD Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits	RER	RER Limit
Radium-228	11.7	2.831	*	1.27	1.00	1.78	pCi/L	24	75 - 125	3.46	1

Carrier	LCSD %Yield	LCSD Qualifier	Limits
Ba Carrier	27.9	X	40 - 110
Y Carrier	86.7		40 - 110

QC Association Summary

Client: Consumers Energy
 Project/Site: JH Campbell Background Wells

Job ID: 160-37918-1

Rad

Prep Batch: 470052

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-37918-1	JHC-MW-15024	Total/NA	Water	PrecSep STD	
160-37918-2	JHC-MW-15025	Total/NA	Water	PrecSep STD	
160-37918-3	JHC-MW-15027	Total/NA	Water	PrecSep STD	
160-37918-4	JHC-MW-15023	Total/NA	Water	PrecSep STD	
160-37918-5	JHC-MW-15026	Total/NA	Water	PrecSep STD	
160-37918-6	JHC-MW-15028	Total/NA	Water	PrecSep STD	
160-37918-7	DUP-03	Total/NA	Water	PrecSep STD	
160-37918-8	EB-03	Total/NA	Water	PrecSep STD	
160-37918-9	FB-03	Total/NA	Water	PrecSep STD	
MB 160-470052/12-A	Method Blank	Total/NA	Water	PrecSep STD	
LCS 160-470052/1-A	Lab Control Sample	Total/NA	Water	PrecSep STD	
LCSD 160-470052/2-A	Lab Control Sample Dup	Total/NA	Water	PrecSep STD	

Prep Batch: 471099

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-37918-1	JHC-MW-15024	Total/NA	Water	PrecSep_0	
160-37918-2	JHC-MW-15025	Total/NA	Water	PrecSep_0	
160-37918-3	JHC-MW-15027	Total/NA	Water	PrecSep_0	
160-37918-4	JHC-MW-15023	Total/NA	Water	PrecSep_0	
160-37918-5	JHC-MW-15026	Total/NA	Water	PrecSep_0	
160-37918-6	JHC-MW-15028	Total/NA	Water	PrecSep_0	
160-37918-7	DUP-03	Total/NA	Water	PrecSep_0	
160-37918-8	EB-03	Total/NA	Water	PrecSep_0	
160-37918-9	FB-03	Total/NA	Water	PrecSep_0	
MB 160-471099/13-A	Method Blank	Total/NA	Water	PrecSep_0	
LCS 160-471099/1-A	Lab Control Sample	Total/NA	Water	PrecSep_0	
LCSD 160-471099/2-A	Lab Control Sample Dup	Total/NA	Water	PrecSep_0	

Tracer/Carrier Summary

Client: Consumers Energy
 Project/Site: JH Campbell Background Wells

Job ID: 160-37918-1

Method: 903.0 - Radium-226 (GFPC)

Matrix: Water

Prep Type: Total/NA

			Percent Yield (Acceptance Limits)			
Lab Sample ID	Client Sample ID	Ba Carrier (40-110)				
160-37918-1	JHC-MW-15024	91.8				
160-37918-2	JHC-MW-15025	64.2				
160-37918-3	JHC-MW-15027	95.9				
160-37918-4	JHC-MW-15023	95.6				
160-37918-5	JHC-MW-15026	107				
160-37918-6	JHC-MW-15028	90.9				
160-37918-7	DUP-03	96.9				
160-37918-8	EB-03	82.7				
160-37918-9	FB-03	82.7				
LCS 160-470052/1-A	Lab Control Sample	78.0				
LCSD 160-470052/2-A	Lab Control Sample Dup	94.7				
MB 160-470052/12-A	Method Blank	101				
Tracer/Carrier Legend						
Ba Carrier = Ba Carrier						

Method: 904.0 - Radium-228 (GFPC)

Matrix: Water

Prep Type: Total/NA

					Percent Yield (Acceptance Limits)			
Lab Sample ID	Client Sample ID	Ba Carrier (40-110)	Y Carrier (40-110)					
160-37918-1	JHC-MW-15024	65.6	87.1					
160-37918-2	JHC-MW-15025	25.8 X	83.7					
160-37918-3	JHC-MW-15027	34.7 X	86.7					
160-37918-4	JHC-MW-15023	75.7	89.3					
160-37918-5	JHC-MW-15026	79.8	79.3					
160-37918-6	JHC-MW-15028	76.9	87.1					
160-37918-7	DUP-03	81.0	90.5					
160-37918-8	EB-03	80.7	91.6					
160-37918-9	FB-03	89.0	92.3					
LCS 160-471099/1-A	Lab Control Sample	80.7	86.4					
LCSD 160-471099/2-A	Lab Control Sample Dup	27.9 X	86.7					
MB 160-471099/13-A	Method Blank	92.3	90.5					
Tracer/Carrier Legend								
Ba Carrier = Ba Carrier								
Y Carrier = Y Carrier								

To: KDStarken, JH Campbell Complex

From: EBlaj, T-258

Date: May 04, 2020

Subject: JH CAMPBELL SOLID WASTE DISPOSAL AREA – GROUNDWATER MONITORING
2nd Quarter, 2020 – Pond A Wells

CC: BLSwanberg, P22-119
BTRunkel, P22-120
HDRegister, P22-521

Sarah Holmstrom, Project Manager
TRC Companies, Inc.
1540 Eisenhower Place
Ann Arbor, MI 48108

Chemistry Project: 20-0384

CE Laboratory Services conducted groundwater monitoring on 04/13/2020 through 04/16/2020 at the JH Campbell Solid Waste Disposal Area, for the 2nd Quarter monitoring requirements. The samples were received in the Chemistry department on 04/16/2020.

Samples for Radium analysis have been subcontracted to Eurofins/TestAmerica, Inc. and their results are being reported separately. Samples for Total Sulfide have been subcontracted to Merit Laboratories, Inc. The results are listed under the analyst initials “Merit” and the original report is attached. Please note that the subcontracted work is not reported under the CE laboratory scope of accreditation.

With the exception noted above, the report that follows presents the results of the requested analytical testing; the results apply only to the samples, as received. All samples have been analyzed in accordance with the 2009 TNI Standard and the applicable A2LA accreditation scope for Laboratory Services. Any exceptions to applicable test method criteria and standard compliance are noted in the Case Narrative, or flagged with applicable qualifiers in the analytical results section.

Reviewed and approved by:

Emil Blaj
Sr. Technical Analyst
Project Lead



Testing performed in accordance with the A2LA scope of accreditation specified in the listed certificate. The information contained in this report is the sole property of Consumers Energy. It cannot be reproduced except in full, and with consent from Consumers Energy, or the customer for which this report was issued.

CASE NARRATIVE

I. Sample Receipt

All samples were received within hold time and in good conditions; no anomalies were noted on the Sample Log-In Shipment Inspection Form during sample check-in. Identification of all samples included in the work order/project is provided in the sample summary section. Sample preservation upon receipt was verified by the sample custodian and confirmed to meet method requirements.

NOTE: A typo on the Chain of Custody form regarding the project number has been corrected upon laboratory sample receipt.

II. Methodology

Unless otherwise indicated, sample preparation and analysis was performed in accordance with the corresponding test methods from “Methods for the Determination of Inorganic Substances in Environmental Samples (EPA/600/R-93/100); SW-846, “Test Methods for Evaluating Solid Waste – Physical/Chemical Methods”, USEPA (latest revisions), and Standard Methods for the Examination of Water and Wastewater, APHA-AWWA-WPCF, 22nd Edition, 2012.

III. Results/Quality Control

Analytical results for this report are presented by laboratory sample ID, container & aliquot number. Results for the field blanks, field duplicates, and percent recoveries of the field matrix spike & matrix spike duplicate samples are included in the results section. Unless specifically noted in the case narrative, all method quality control requirements have been met. If any results are qualified, the corresponding data flags/qualifiers are listed on the last page of the results section. Any additional information on method performance, when applicable, is presented in this section of the case narrative. When data flags are not needed, the qualifiers text box on the last page is left blank, and a statement confirms that no exceptions occurred.

NOTE: Due to matrix interference / possible carry over effects the reporting limit for Silver has been increased for sample 20-0384-01 and 20-0384-06; the results have been flagged (K).

DEFINITIONS / QUALIFIERS

The following qualifiers and/or acronyms are used in the report where applicable:

<u>Acronym</u>	<u>Description</u>
RL	Reporting Limit
ND	Result not detected or below Reporting Limit
NT	Not a TNI Analyte
LCS	Laboratory Control Sample
LRB	Laboratory Reagent Blank (also referred to as Method Blank)
DUP	Duplicate
MS	Matrix Spike
MSD	Matrix Spike Duplicate
RPD	Relative Percent Difference
MDL	Method Detection Limit
PQL	Practical Quantitation Limit

TDL Target Detection Limit
SM Standard Methods Compendium

<u>Qualifier</u>	<u>Description</u>
*	Generic data flag, applicable description added in the corresponding notes section
B	The analyte was detected in the LRB at a level which is significant relative to sample result
D	Reporting limit elevated due to dilution
E	Estimated due to result exceeding the linear range of the analyzer
H	The maximum recommended hold time was exceeded
I	Dilution required due to matrix interference; reporting limit elevated
J	Estimated due to result found above MDL but below PQL (or RL)
K	Reporting limit raised due to matrix interference
M	The precision for duplicate analysis was not met; RPD outside acceptance criteria
N	Non-homogeneous sample made analysis questionable
PI	Possible interference may have affected the accuracy of the laboratory result
Q	Matrix Spike or Matrix Spike Duplicate recovery outside acceptance criteria
R	Result confirmed by new sample preparation and reanalysis
X	Other notation required; comment listed in sample notes and/or case narrative

Customer Name: JH Campbell Complex
Work Order ID: Q2 Pond A Wells
Date Received: 4/16/2020
Chemistry Project: 20-0384

<u>Sample #</u>	<u>Field Sample ID</u>	<u>Matrix</u>	<u>Sample Date</u>	<u>Site</u>
20-0384-01	JHC-MW-15006	Groundwater	04/14/2020 03:01 PM	JHC RCRA GW Monitoring - Pond A Unit
20-0384-02	JHC-MW-15007	Groundwater	04/14/2020 12:12 PM	JHC RCRA GW Monitoring - Pond A Unit
20-0384-03	JHC-MW-15008R	Groundwater	04/14/2020 11:26 AM	JHC RCRA GW Monitoring - Pond A Unit
20-0384-04	JHC-MW-15009	Groundwater	04/14/2020 10:36 AM	JHC RCRA GW Monitoring - Pond A Unit
20-0384-05	JHC-MW-15010	Groundwater	04/14/2020 09:42 AM	JHC RCRA GW Monitoring - Pond A Unit
20-0384-06	JHC-MW-15011	Groundwater	04/15/2020 09:36 AM	JHC RCRA GW Monitoring - Pond A Unit
20-0384-07	DUP-02	Groundwater	04/14/2020 10:36 AM	JHC RCRA GW Monitoring - Pond A Unit
20-0384-08	EB-02	Groundwater	04/14/2020 09:46 AM	JHC RCRA GW Monitoring - Pond A Unit
20-0384-09	FB-02	Groundwater	04/14/2020 03:06 PM	JHC RCRA GW Monitoring - Pond A Unit
20-0384-10	JHC-MW-15007 Field MS	Groundwater	04/14/2020 12:12 PM	JHC RCRA GW Monitoring - Pond A Unit
20-0384-11	JHC-MW-15007 Field MSD	Groundwater	04/14/2020 12:12 PM	JHC RCRA GW Monitoring - Pond A Unit

Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **JHC RCRA GW Monitoring - Pond A Unit (395496)**
 Field Sample ID: **JHC-MW-15006**
 Lab Sample ID: 20-0384-01
 Matrix: Groundwater

Laboratory Project: **20-0384**
 Collect Date: 04/14/2020
 Collect Time: 03:01 PM

Total Mercury by EPA 7470A, Aqueous

Aliquot: 20-0384-01-C02-A01

Analyst: TMR

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Mercury	ND		ug/L	0.2	04/20/2020	AB20-0420-10

Metals by EPA 6020B: HMP-AMP Detection & Assessment Monitorin

Aliquot: 20-0384-01-C02-A02

Analyst: SLK

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Antimony	1		ug/L	1	04/27/2020	AB20-0427-04
Arsenic	5		ug/L	1	04/27/2020	AB20-0427-04
Barium	353		ug/L	5	04/27/2020	AB20-0427-04
Beryllium	ND		ug/L	1	04/27/2020	AB20-0427-04
Boron	284		ug/L	20	04/27/2020	AB20-0427-04
Cadmium	ND		ug/L	0.2	04/27/2020	AB20-0427-04
Calcium	102000		ug/L	1000	04/28/2020	AB20-0427-04
Chromium	1		ug/L	1	04/27/2020	AB20-0427-04
Cobalt	ND		ug/L	15	04/27/2020	AB20-0427-04
Copper	1		ug/L	1	04/27/2020	AB20-0427-04
Iron	26		ug/L	20	04/28/2020	AB20-0427-04
Lead	ND		ug/L	1	04/27/2020	AB20-0427-04
Lithium	13		ug/L	10	04/27/2020	AB20-0427-04
Molybdenum	16		ug/L	5	04/27/2020	AB20-0427-04
Nickel	1		ug/L	1	04/27/2020	AB20-0427-04
Selenium	9		ug/L	1	04/27/2020	AB20-0427-04
Silver	ND	K	ug/L	0.4	04/27/2020	AB20-0427-04
Thallium	ND		ug/L	2	04/27/2020	AB20-0427-04
Vanadium	10		ug/L	2	04/27/2020	AB20-0427-04
Zinc	ND		ug/L	10	04/27/2020	AB20-0427-04

Anions by EPA 300.0 CCR Rule Analyte List, Cl, F, SO4, Aqueous

Aliquot: 20-0384-01-C03-A01

Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Chloride	24900		ug/L	1000	04/22/2020	AB20-0422-04
Fluoride	ND		ug/L	1000	04/22/2020	AB20-0422-04
Sulfate	260000		ug/L	2000	04/24/2020	AB20-0422-04

Total Dissolved Solids by SM 2540C

Aliquot: 20-0384-01-C04-A01

Analyst: SLK

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Total Dissolved Solids	562		mg/L	10	04/17/2020	AB20-0417-02

Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **JHC RCRA GW Monitoring - Pond A Unit (395496)**
 Field Sample ID: **JHC-MW-15007**
 Lab Sample ID: 20-0384-02
 Matrix: Groundwater

Laboratory Project: **20-0384**
 Collect Date: 04/14/2020
 Collect Time: 12:12 PM

Total Mercury by EPA 7470A, Aqueous

Aliquot: 20-0384-02-C02-A01

Analyst: TMR

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Mercury	ND		ug/L	0.2	04/20/2020	AB20-0420-10

Metals by EPA 6020B: HMP-AMP Detection & Assessment Monitorin

Aliquot: 20-0384-02-C02-A02

Analyst: SLK

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Antimony	ND		ug/L	1	04/27/2020	AB20-0427-04
Arsenic	3		ug/L	1	04/27/2020	AB20-0427-04
Barium	266		ug/L	5	04/27/2020	AB20-0427-04
Beryllium	ND		ug/L	1	04/27/2020	AB20-0427-04
Boron	242		ug/L	20	04/27/2020	AB20-0427-04
Cadmium	ND		ug/L	0.2	04/27/2020	AB20-0427-04
Calcium	62100		ug/L	1000	04/28/2020	AB20-0427-04
Chromium	2		ug/L	1	04/27/2020	AB20-0427-04
Cobalt	ND		ug/L	15	04/27/2020	AB20-0427-04
Copper	1		ug/L	1	04/27/2020	AB20-0427-04
Iron	ND		ug/L	20	04/28/2020	AB20-0427-04
Lead	ND		ug/L	1	04/27/2020	AB20-0427-04
Lithium	14		ug/L	10	04/27/2020	AB20-0427-04
Molybdenum	ND		ug/L	5	04/27/2020	AB20-0427-04
Nickel	ND		ug/L	1	04/27/2020	AB20-0427-04
Selenium	22		ug/L	1	04/27/2020	AB20-0427-04
Silver	ND		ug/L	0.2	04/27/2020	AB20-0427-04
Thallium	ND		ug/L	2	04/27/2020	AB20-0427-04
Vanadium	14		ug/L	2	04/27/2020	AB20-0427-04
Zinc	ND		ug/L	10	04/27/2020	AB20-0427-04

Anions by EPA 300.0 CCR Rule Analyte List, Cl, F, SO4, Aqueous

Aliquot: 20-0384-02-C03-A01

Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Chloride	14100		ug/L	1000	04/22/2020	AB20-0422-04
Fluoride	ND		ug/L	1000	04/22/2020	AB20-0422-04
Sulfate	83000		ug/L	2000	04/22/2020	AB20-0422-04

Total Dissolved Solids by SM 2540C

Aliquot: 20-0384-02-C04-A01

Analyst: SLK

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Total Dissolved Solids	336		mg/L	10	04/17/2020	AB20-0417-02

Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **JHC RCRA GW Monitoring - Pond A Unit (395496)**
 Field Sample ID: **JHC-MW-15008R**
 Lab Sample ID: 20-0384-03
 Matrix: Groundwater

Laboratory Project: **20-0384**
 Collect Date: 04/14/2020
 Collect Time: 11:26 AM

Total Mercury by EPA 7470A, Aqueous

Aliquot: 20-0384-03-C02-A01

Analyst: TMR

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Mercury	ND		ug/L	0.2	04/20/2020	AB20-0420-10

Metals by EPA 6020B: HMP-AMP Detection & Assessment Monitorin

Aliquot: 20-0384-03-C02-A02

Analyst: SLK

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Antimony	1		ug/L	1	04/27/2020	AB20-0427-04
Arsenic	ND		ug/L	1	04/27/2020	AB20-0427-04
Barium	252		ug/L	5	04/27/2020	AB20-0427-04
Beryllium	ND		ug/L	1	04/27/2020	AB20-0427-04
Boron	505		ug/L	20	04/27/2020	AB20-0427-04
Cadmium	ND		ug/L	0.2	04/27/2020	AB20-0427-04
Calcium	99900		ug/L	1000	04/28/2020	AB20-0427-04
Chromium	ND		ug/L	1	04/27/2020	AB20-0427-04
Cobalt	ND		ug/L	15	04/27/2020	AB20-0427-04
Copper	2		ug/L	1	04/27/2020	AB20-0427-04
Iron	134		ug/L	20	04/28/2020	AB20-0427-04
Lead	ND		ug/L	1	04/27/2020	AB20-0427-04
Lithium	19		ug/L	10	04/27/2020	AB20-0427-04
Molybdenum	ND		ug/L	5	04/27/2020	AB20-0427-04
Nickel	ND		ug/L	1	04/27/2020	AB20-0427-04
Selenium	6		ug/L	1	04/27/2020	AB20-0427-04
Silver	ND		ug/L	0.2	04/27/2020	AB20-0427-04
Thallium	ND		ug/L	2	04/27/2020	AB20-0427-04
Vanadium	ND		ug/L	2	04/27/2020	AB20-0427-04
Zinc	ND		ug/L	10	04/27/2020	AB20-0427-04

Anions by EPA 300.0 CCR Rule Analyte List, Cl, F, SO4, Aqueous

Aliquot: 20-0384-03-C03-A01

Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Chloride	25000		ug/L	1000	04/22/2020	AB20-0422-04
Fluoride	ND		ug/L	1000	04/22/2020	AB20-0422-04
Sulfate	235000		ug/L	2000	04/24/2020	AB20-0422-04

Total Dissolved Solids by SM 2540C

Aliquot: 20-0384-03-C04-A01

Analyst: SLK

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Total Dissolved Solids	566		mg/L	10	04/17/2020	AB20-0417-02

Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **JHC RCRA GW Monitoring - Pond A Unit (395496)**
 Field Sample ID: **JHC-MW-15009**
 Lab Sample ID: 20-0384-04
 Matrix: Groundwater

Laboratory Project: **20-0384**
 Collect Date: 04/14/2020
 Collect Time: 10:36 AM

Total Mercury by EPA 7470A, Aqueous

Aliquot: 20-0384-04-C02-A01

Analyst: TMR

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Mercury	ND		ug/L	0.2	04/20/2020	AB20-0420-10

Metals by EPA 6020B: HMP-AMP Detection & Assessment Monitorin

Aliquot: 20-0384-04-C02-A02

Analyst: SLK

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Antimony	1		ug/L	1	04/27/2020	AB20-0427-04
Arsenic	ND		ug/L	1	04/27/2020	AB20-0427-04
Barium	307		ug/L	5	04/27/2020	AB20-0427-04
Beryllium	ND		ug/L	1	04/27/2020	AB20-0427-04
Boron	874		ug/L	20	04/27/2020	AB20-0427-04
Cadmium	ND		ug/L	0.2	04/27/2020	AB20-0427-04
Calcium	78700		ug/L	1000	04/28/2020	AB20-0427-04
Chromium	1		ug/L	1	04/27/2020	AB20-0427-04
Cobalt	ND		ug/L	15	04/27/2020	AB20-0427-04
Copper	1		ug/L	1	04/27/2020	AB20-0427-04
Iron	ND		ug/L	20	04/28/2020	AB20-0427-04
Lead	ND		ug/L	1	04/27/2020	AB20-0427-04
Lithium	14		ug/L	10	04/27/2020	AB20-0427-04
Molybdenum	ND		ug/L	5	04/27/2020	AB20-0427-04
Nickel	ND		ug/L	1	04/27/2020	AB20-0427-04
Selenium	77		ug/L	1	04/27/2020	AB20-0427-04
Silver	ND		ug/L	0.2	04/27/2020	AB20-0427-04
Thallium	ND		ug/L	2	04/27/2020	AB20-0427-04
Vanadium	ND		ug/L	2	04/27/2020	AB20-0427-04
Zinc	ND		ug/L	10	04/27/2020	AB20-0427-04

Anions by EPA 300.0 CCR Rule Analyte List, Cl, F, SO4, Aqueous

Aliquot: 20-0384-04-C03-A01

Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Chloride	6950		ug/L	1000	04/22/2020	AB20-0422-04
Fluoride	ND		ug/L	1000	04/22/2020	AB20-0422-04
Sulfate	49100		ug/L	2000	04/22/2020	AB20-0422-04

Total Dissolved Solids by SM 2540C

Aliquot: 20-0384-04-C04-A01

Analyst: SLK

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Total Dissolved Solids	354		mg/L	10	04/17/2020	AB20-0417-02

Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **JHC RCRA GW Monitoring - Pond A Unit (395496)**
 Field Sample ID: **JHC-MW-15010**
 Lab Sample ID: 20-0384-05
 Matrix: Groundwater

Laboratory Project: **20-0384**
 Collect Date: 04/14/2020
 Collect Time: 09:42 AM

Total Mercury by EPA 7470A, Aqueous

Aliquot: 20-0384-05-C02-A01

Analyst: TMR

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Mercury	ND		ug/L	0.2	04/20/2020	AB20-0420-10

Metals by EPA 6020B: HMP-AMP Detection & Assessment Monitorin

Aliquot: 20-0384-05-C02-A02

Analyst: SLK

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Antimony	ND		ug/L	1	04/27/2020	AB20-0427-04
Arsenic	ND		ug/L	1	04/27/2020	AB20-0427-04
Barium	276		ug/L	5	04/27/2020	AB20-0427-04
Beryllium	ND		ug/L	1	04/27/2020	AB20-0427-04
Boron	2350		ug/L	20	04/27/2020	AB20-0427-04
Cadmium	ND		ug/L	0.2	04/27/2020	AB20-0427-04
Calcium	82700		ug/L	1000	04/28/2020	AB20-0427-04
Chromium	1		ug/L	1	04/27/2020	AB20-0427-04
Cobalt	ND		ug/L	15	04/27/2020	AB20-0427-04
Copper	1		ug/L	1	04/27/2020	AB20-0427-04
Iron	ND		ug/L	20	04/28/2020	AB20-0427-04
Lead	ND		ug/L	1	04/27/2020	AB20-0427-04
Lithium	20		ug/L	10	04/27/2020	AB20-0427-04
Molybdenum	ND		ug/L	5	04/27/2020	AB20-0427-04
Nickel	ND		ug/L	1	04/27/2020	AB20-0427-04
Selenium	158		ug/L	1	04/27/2020	AB20-0427-04
Silver	ND		ug/L	0.2	04/27/2020	AB20-0427-04
Thallium	ND		ug/L	2	04/27/2020	AB20-0427-04
Vanadium	4		ug/L	2	04/27/2020	AB20-0427-04
Zinc	ND		ug/L	10	04/27/2020	AB20-0427-04

Anions by EPA 300.0 CCR Rule Analyte List, Cl, F, SO4, Aqueous

Aliquot: 20-0384-05-C03-A01

Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Chloride	3200		ug/L	1000	04/22/2020	AB20-0422-05
Fluoride	ND		ug/L	1000	04/22/2020	AB20-0422-05
Sulfate	35900		ug/L	2000	04/22/2020	AB20-0422-05

Total Dissolved Solids by SM 2540C

Aliquot: 20-0384-05-C04-A01

Analyst: SLK

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Total Dissolved Solids	333		mg/L	10	04/17/2020	AB20-0417-02

Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **JHC RCRA GW Monitoring - Pond A Unit (395496)**
 Field Sample ID: **JHC-MW-15011**
 Lab Sample ID: 20-0384-06
 Matrix: Groundwater

Laboratory Project: **20-0384**
 Collect Date: 04/15/2020
 Collect Time: 09:36 AM

Total Mercury by EPA 7470A, Aqueous

Aliquot: 20-0384-06-C02-A01

Analyst: TMR

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Mercury	ND		ug/L	0.2	04/20/2020	AB20-0420-10

Metals by EPA 6020B: CCR Rule Appendix III-IV Total Metals Expand

Aliquot: 20-0384-06-C02-A02

Analyst: SLK

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Antimony	4		ug/L	1	04/27/2020	AB20-0427-04
Arsenic	25		ug/L	1	04/27/2020	AB20-0427-04
Barium	514		ug/L	5	04/27/2020	AB20-0427-04
Beryllium	ND		ug/L	1	04/27/2020	AB20-0427-04
Boron	2870		ug/L	20	04/27/2020	AB20-0427-04
Cadmium	0.2		ug/L	0.2	04/27/2020	AB20-0427-04
Calcium	112000		ug/L	1000	04/28/2020	AB20-0427-04
Chromium	ND		ug/L	1	04/27/2020	AB20-0427-04
Cobalt	ND		ug/L	6	04/27/2020	AB20-0427-04
Copper	1		ug/L	1	04/27/2020	AB20-0427-04
Iron	145		ug/L	20	04/28/2020	AB20-0427-04
Lead	ND		ug/L	1	04/27/2020	AB20-0427-04
Lithium	21		ug/L	10	04/27/2020	AB20-0427-04
Magnesium	39500		ug/L	1000	04/28/2020	AB20-0427-04
Molybdenum	7		ug/L	5	04/27/2020	AB20-0427-04
Nickel	ND		ug/L	2	04/27/2020	AB20-0427-04
Potassium	6640		ug/L	100	04/28/2020	AB20-0427-04
Selenium	29		ug/L	1	04/27/2020	AB20-0427-04
Silver	ND	K	ug/L	0.4	04/27/2020	AB20-0427-04
Sodium	11700		ug/L	1000	04/28/2020	AB20-0427-04
Thallium	ND		ug/L	2	04/27/2020	AB20-0427-04
Vanadium	40		ug/L	2	04/27/2020	AB20-0427-04
Zinc	ND		ug/L	10	04/27/2020	AB20-0427-04

Anions by EPA 300.0 Aqueous, NO2, NO3

Aliquot: 20-0384-06-C03-A01

Analyst: JDM

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Nitrate	ND		ug/L	100	04/16/2020	AB20-0420-05
Nitrite	ND		ug/L	100	04/16/2020	AB20-0420-05

Anions by EPA 300.0 CCR Rule Analyte List, Cl, F, SO4, Aqueous

Aliquot: 20-0384-06-C03-A02

Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Chloride	4160		ug/L	1000	04/22/2020	AB20-0422-05
Fluoride	ND		ug/L	1000	04/22/2020	AB20-0422-05
Sulfate	183000		ug/L	2000	04/22/2020	AB20-0422-05

Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **JHC RCRA GW Monitoring - Pond A Unit (395496)**
 Field Sample ID: **JHC-MW-15011**
 Lab Sample ID: 20-0384-06
 Matrix: Groundwater

Laboratory Project: **20-0384**
 Collect Date: 04/15/2020
 Collect Time: 09:36 AM

Total Dissolved Solids by SM 2540C

Aliquot: 20-0384-06-C04-A01 Analyst: SLK

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Total Dissolved Solids	542		mg/L	10	04/17/2020	AB20-0417-02

Nitrogen-Ammonia by SM4500NH3(h), Groundwater HL

Aliquot: 20-0384-06-C07-A01 Analyst: BEK

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Ammonia	ND		ug/L	25	04/21/2020	AB20-0421-16

Alkalinity by SM 2320B

Aliquot: 20-0384-06-C08-A01 Analyst: BEK

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Alkalinity total	260000		ug/L	10000	04/17/2020	AB20-0423-15
Alkalinity bicarbonate	260000		ug/L	10000	04/17/2020	AB20-0423-15
Alkalinity carbonate	ND		ug/L	10000	04/17/2020	AB20-0423-15

Sulfide, Total by SM 4500 S2D

Aliquot: 20-0384-06-C10-A01 Analyst: Merit

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Sulfide	ND		ug/L	40	04/20/2020	AB20-0429-12

Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **JHC RCRA GW Monitoring - Pond A Unit (395496)**
 Field Sample ID: **DUP-02**
 Lab Sample ID: 20-0384-07
 Matrix: Groundwater

Laboratory Project: **20-0384**
 Collect Date: 04/14/2020
 Collect Time: 10:36 AM

Total Mercury by EPA 7470A, Aqueous

Aliquot: 20-0384-07-C02-A01

Analyst: TMR

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Mercury	ND		ug/L	0.2	04/20/2020	AB20-0420-10

Metals by EPA 6020B: HMP-AMP Detection & Assessment Monitorin

Aliquot: 20-0384-07-C02-A02

Analyst: SLK

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Antimony	1		ug/L	1	04/27/2020	AB20-0427-04
Arsenic	ND		ug/L	1	04/27/2020	AB20-0427-04
Barium	298		ug/L	5	04/27/2020	AB20-0427-04
Beryllium	ND		ug/L	1	04/27/2020	AB20-0427-04
Boron	881		ug/L	20	04/27/2020	AB20-0427-04
Cadmium	ND		ug/L	0.2	04/27/2020	AB20-0427-04
Calcium	79900		ug/L	1000	04/28/2020	AB20-0427-04
Chromium	1		ug/L	1	04/27/2020	AB20-0427-04
Cobalt	ND		ug/L	15	04/27/2020	AB20-0427-04
Copper	2		ug/L	1	04/27/2020	AB20-0427-04
Iron	ND		ug/L	20	04/28/2020	AB20-0427-04
Lead	ND		ug/L	1	04/27/2020	AB20-0427-04
Lithium	14		ug/L	10	04/27/2020	AB20-0427-04
Molybdenum	ND		ug/L	5	04/27/2020	AB20-0427-04
Nickel	1		ug/L	1	04/27/2020	AB20-0427-04
Selenium	79		ug/L	1	04/27/2020	AB20-0427-04
Silver	ND		ug/L	0.2	04/27/2020	AB20-0427-04
Thallium	ND		ug/L	2	04/27/2020	AB20-0427-04
Vanadium	ND		ug/L	2	04/27/2020	AB20-0427-04
Zinc	ND		ug/L	10	04/27/2020	AB20-0427-04

Anions by EPA 300.0 CCR Rule Analyte List, Cl, F, SO4, Aqueous

Aliquot: 20-0384-07-C03-A01

Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Chloride	6780		ug/L	1000	04/22/2020	AB20-0422-05
Fluoride	ND		ug/L	1000	04/22/2020	AB20-0422-05
Sulfate	49900		ug/L	2000	04/22/2020	AB20-0422-05

Total Dissolved Solids by SM 2540C

Aliquot: 20-0384-07-C04-A01

Analyst: SLK

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Total Dissolved Solids	341		mg/L	10	04/17/2020	AB20-0417-02

Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **JHC RCRA GW Monitoring - Pond A Unit (395496)**
 Field Sample ID: **EB-02**
 Lab Sample ID: 20-0384-08
 Matrix: Groundwater

Laboratory Project: **20-0384**
 Collect Date: 04/14/2020
 Collect Time: 09:46 AM

Total Mercury by EPA 7470A, Aqueous

Aliquot: 20-0384-08-C02-A01

Analyst: TMR

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Mercury	ND		ug/L	0.2	04/20/2020	AB20-0420-10

Metals by EPA 6020B: HMP-AMP Detection & Assessment Monitorin

Aliquot: 20-0384-08-C02-A02

Analyst: SLK

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Antimony	ND		ug/L	1	04/27/2020	AB20-0427-04
Arsenic	ND		ug/L	1	04/27/2020	AB20-0427-04
Barium	ND		ug/L	5	04/27/2020	AB20-0427-04
Beryllium	ND		ug/L	1	04/27/2020	AB20-0427-04
Boron	ND		ug/L	20	04/27/2020	AB20-0427-04
Cadmium	ND		ug/L	0.2	04/27/2020	AB20-0427-04
Calcium	ND		ug/L	1000	04/28/2020	AB20-0427-04
Chromium	ND		ug/L	1	04/27/2020	AB20-0427-04
Cobalt	ND		ug/L	15	04/27/2020	AB20-0427-04
Copper	ND		ug/L	1	04/27/2020	AB20-0427-04
Iron	ND		ug/L	20	04/28/2020	AB20-0427-04
Lead	ND		ug/L	1	04/27/2020	AB20-0427-04
Lithium	ND		ug/L	10	04/27/2020	AB20-0427-04
Molybdenum	ND		ug/L	5	04/27/2020	AB20-0427-04
Nickel	ND		ug/L	1	04/27/2020	AB20-0427-04
Selenium	ND		ug/L	1	04/27/2020	AB20-0427-04
Silver	ND		ug/L	0.2	04/27/2020	AB20-0427-04
Thallium	ND		ug/L	2	04/27/2020	AB20-0427-04
Vanadium	ND		ug/L	2	04/27/2020	AB20-0427-04
Zinc	ND		ug/L	10	04/27/2020	AB20-0427-04

Anions by EPA 300.0 CCR Rule Analyte List, Cl, F, SO4, Aqueous

Aliquot: 20-0384-08-C03-A01

Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Chloride	ND		ug/L	1000	04/22/2020	AB20-0422-05
Fluoride	ND		ug/L	1000	04/22/2020	AB20-0422-05
Sulfate	ND		ug/L	2000	04/22/2020	AB20-0422-05

Total Dissolved Solids by SM 2540C

Aliquot: 20-0384-08-C04-A01

Analyst: SLK

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Total Dissolved Solids	ND		mg/L	10	04/17/2020	AB20-0417-02

Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **JHC RCRA GW Monitoring - Pond A Unit (395496)**
 Field Sample ID: **FB-02**
 Lab Sample ID: 20-0384-09
 Matrix: Groundwater

Laboratory Project: **20-0384**
 Collect Date: 04/14/2020
 Collect Time: 03:06 PM

Total Mercury by EPA 7470A, Aqueous

Aliquot: 20-0384-09-C02-A01

Analyst: TMR

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Mercury	ND		ug/L	0.2	04/20/2020	AB20-0420-10

Metals by EPA 6020B: HMP-AMP Detection & Assessment Monitorin

Aliquot: 20-0384-09-C02-A02

Analyst: SLK

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Antimony	ND		ug/L	1	04/27/2020	AB20-0427-04
Arsenic	ND		ug/L	1	04/27/2020	AB20-0427-04
Barium	ND		ug/L	5	04/27/2020	AB20-0427-04
Beryllium	ND		ug/L	1	04/27/2020	AB20-0427-04
Boron	ND		ug/L	20	04/27/2020	AB20-0427-04
Cadmium	ND		ug/L	0.2	04/27/2020	AB20-0427-04
Calcium	ND		ug/L	1000	04/28/2020	AB20-0427-04
Chromium	ND		ug/L	1	04/27/2020	AB20-0427-04
Cobalt	ND		ug/L	15	04/27/2020	AB20-0427-04
Copper	ND		ug/L	1	04/27/2020	AB20-0427-04
Iron	ND		ug/L	20	04/28/2020	AB20-0427-04
Lead	ND		ug/L	1	04/27/2020	AB20-0427-04
Lithium	ND		ug/L	10	04/27/2020	AB20-0427-04
Molybdenum	ND		ug/L	5	04/27/2020	AB20-0427-04
Nickel	ND		ug/L	1	04/27/2020	AB20-0427-04
Selenium	ND		ug/L	1	04/27/2020	AB20-0427-04
Silver	ND		ug/L	0.2	04/27/2020	AB20-0427-04
Thallium	ND		ug/L	2	04/27/2020	AB20-0427-04
Vanadium	ND		ug/L	2	04/27/2020	AB20-0427-04
Zinc	13		ug/L	10	04/27/2020	AB20-0427-04

Anions by EPA 300.0 CCR Rule Analyte List, Cl, F, SO4, Aqueous

Aliquot: 20-0384-09-C03-A01

Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Chloride	ND		ug/L	1000	04/22/2020	AB20-0422-05
Fluoride	ND		ug/L	1000	04/22/2020	AB20-0422-05
Sulfate	ND		ug/L	2000	04/22/2020	AB20-0422-05

Total Dissolved Solids by SM 2540C

Aliquot: 20-0384-09-C04-A01

Analyst: SLK

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Total Dissolved Solids	ND		mg/L	10	04/17/2020	AB20-0417-02

Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **JHC RCRA GW Monitoring - Pond A Unit (395496)**
 Field Sample ID: **JHC-MW-15007 Field MS**
 Lab Sample ID: 20-0384-10
 Matrix: Groundwater

Laboratory Project: **20-0384**
 Collect Date: 04/14/2020
 Collect Time: 12:12 PM

Total Mercury by EPA 7470A, Aqueous

Aliquot: 20-0384-10-C02-A01

Analyst: TMR

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Mercury	100		%	0.2	04/20/2020	AB20-0420-10

Metals by EPA 6020B: HMP-AMP Detection & Assessment Monitorin

Aliquot: 20-0384-10-C02-A02

Analyst: SLK

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Antimony	111		%	1	04/27/2020	AB20-0427-04
Arsenic	105		%	1	04/27/2020	AB20-0427-04
Barium	111		%	5	04/27/2020	AB20-0427-04
Beryllium	108		%	1	04/27/2020	AB20-0427-04
Boron	107		%	20	04/27/2020	AB20-0427-04
Cadmium	108		%	0.2	04/27/2020	AB20-0427-04
Calcium	120		%	1000	04/28/2020	AB20-0427-04
Chromium	100		%	1	04/27/2020	AB20-0427-04
Cobalt	97		%	15	04/27/2020	AB20-0427-04
Copper	99		%	1	04/27/2020	AB20-0427-04
Iron	93		%	20	04/28/2020	AB20-0427-04
Lead	105		%	1	04/27/2020	AB20-0427-04
Lithium	107		%	10	04/27/2020	AB20-0427-04
Molybdenum	109		%	5	04/27/2020	AB20-0427-04
Nickel	99		%	1	04/27/2020	AB20-0427-04
Selenium	102		%	1	04/27/2020	AB20-0427-04
Silver	105		%	0.2	04/27/2020	AB20-0427-04
Thallium	104		%	2	04/27/2020	AB20-0427-04
Vanadium	102		%	2	04/27/2020	AB20-0427-04
Zinc	103		%	10	04/27/2020	AB20-0427-04

Anions by EPA 300.0 CCR Rule Analyte List, Cl, F, SO4, Aqueous

Aliquot: 20-0384-10-C03-A01

Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Chloride	99		%	1000	04/22/2020	AB20-0422-05
Fluoride	106		%	1000	04/22/2020	AB20-0422-05
Sulfate	107		%	2000	04/22/2020	AB20-0422-05

Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **JHC RCRA GW Monitoring - Pond A Unit (395496)**
 Field Sample ID: **JHC-MW-15007 Field MSD**
 Lab Sample ID: 20-0384-11
 Matrix: Groundwater

Laboratory Project: **20-0384**
 Collect Date: 04/14/2020
 Collect Time: 12:12 PM

Total Mercury by EPA 7470A, Aqueous

Aliquot: 20-0384-11-C02-A01

Analyst: TMR

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Mercury	102		%	0.2	04/20/2020	AB20-0420-10

Metals by EPA 6020B: HMP-AMP Detection & Assessment Monitorin

Aliquot: 20-0384-11-C02-A02

Analyst: SLK

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Antimony	115		%	1	04/27/2020	AB20-0427-04
Arsenic	106		%	1	04/27/2020	AB20-0427-04
Barium	114		%	5	04/27/2020	AB20-0427-04
Beryllium	109		%	1	04/27/2020	AB20-0427-04
Boron	113		%	20	04/27/2020	AB20-0427-04
Cadmium	110		%	0.2	04/27/2020	AB20-0427-04
Calcium	125		%	1000	04/28/2020	AB20-0427-04
Chromium	100		%	1	04/27/2020	AB20-0427-04
Cobalt	97		%	15	04/27/2020	AB20-0427-04
Copper	98		%	1	04/27/2020	AB20-0427-04
Iron	94		%	20	04/28/2020	AB20-0427-04
Lead	107		%	1	04/27/2020	AB20-0427-04
Lithium	108		%	10	04/27/2020	AB20-0427-04
Molybdenum	111		%	5	04/27/2020	AB20-0427-04
Nickel	100		%	1	04/27/2020	AB20-0427-04
Selenium	105		%	1	04/27/2020	AB20-0427-04
Silver	106		%	0.2	04/27/2020	AB20-0427-04
Thallium	106		%	2	04/27/2020	AB20-0427-04
Vanadium	102		%	2	04/27/2020	AB20-0427-04
Zinc	104		%	10	04/27/2020	AB20-0427-04

Anions by EPA 300.0 CCR Rule Analyte List, Cl, F, SO4, Aqueous

Aliquot: 20-0384-11-C03-A01

Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Chloride	95		%	1000	04/22/2020	AB20-0422-05
Fluoride	101		%	1000	04/22/2020	AB20-0422-05
Sulfate	107		%	2000	04/22/2020	AB20-0422-05

Data Qualifiers	Exception Summary
------------------------	--------------------------

K = RL increased due to matrix interference/possible carry over.

No other exceptions occurred.

TITLE: SAMPLE LOG-IN – SHIPMENT INSPECTION FORM

Project Log-In Number: 20-0384
Inspection Date: 04/16/20 Inspection By: SUK / BEK
Sample Origin/Project Name: JHC QTR. 2 Pond A wells.

Shipment Delivered By: Enter the type of shipment carrier.

Pony _____ FedEx _____ UPS _____ USPS _____ Airborne _____
Other/Hard Carry (whom) S.H. - CONSUMERS
Tracking Number: _____ Shipping Form Attached: Yes _____ No _____

Shipping Containers: Enter the type and number of shipping containers received.

Cooler (1) Cardboard Box _____ Custom Case _____ Envelope/Mailer _____
Loose/Unpackaged Containers _____ Other _____

Condition of Shipment: Enter the as-received condition of the shipment container.

Damaged Shipment Observed: None X Dented _____ Leaking _____
Other _____

Shipment Security: Enter if any of the shipping containers were opened before receipt.

Shipping Containers Received: Opened _____ Sealed X

Enclosed Documents: Enter the type of documents enclosed with the shipment.

CoC X Work Request _____ Air Data Sheet _____ Other _____

Temperature of Containers: Measure the temperature of several sample containers.

As-Received Temperature 3.3-5.0°C Samples Received on Ice: Yes X No _____

Number and Type of Containers: Enter the total number of sample containers received.

Container Type	Water	Soil	Other	Broken	Leaking
VOA (40mL or 60mL)	<u>2</u>	_____	_____	_____	_____
Quart/Liter (Q/P)	<u>18</u>	_____	_____	_____	_____
9-oz (amber glass jar)	_____	_____	_____	_____	_____
2-oz (amber glass)	_____	_____	_____	_____	_____
125 mL (plastic)	<u>25</u>	_____	_____	_____	_____
24 mL vial (glass)	_____	_____	_____	_____	_____
500 mL (plastic)	_____	_____	_____	_____	_____
Other <u>250mL plastic</u>	<u>9</u>	_____	_____	_____	_____

page 1 of 2

CHAIN OF CUSTODY

CONSUMERS ENERGY COMPANY – LABORATORY SERVICES



135 WEST TRAIL ST., JACKSON, MI 49201 • (517) 788-1251 • FAX (517) 788-2533

SAMPLING SITE				PROJECT NUMBER			ANALYSIS REQUESTED								PAGE 1 OF 1	
JHC 2 nd Qtr. 2020 RCRA GW Monitoring Pond A Wells				20-0384			Metals, Total	Anions	TDS	Radium	Alkalinity	Ammonia	Sulfide	Nitrates	SEND REPORT TO Kevin Starken	
SAMPLING TEAM CET / CLH / DMW				DATE SHIPPED		SITE SKETCHED ATTACHED? CIRCLE ONE NO									Beth Swanberg, TRC	
CE CONTROL #	SAMPLE DATE	SAMPLE TIME	SAMPLE MATRIX	SAMPLE DESCRIPTION / LOCATION	DEPTH	# OF CONTAINERS									REMARKS	
0384 83041720 20-0384-01	4.14.20	1501	GW	JHC-MW-15006	--	5	X	X	X	X						
-02	4.14.20	1212	GW	JHC-MW-15007	--	5	X	X	X	X						
-03	4.14.20	1126	GW	JHC-MW-15008R	--	5	X	X	X	X						
-04	4.14.20	1036	GW	JHC-MW-15009	--	5	X	X	X	X						
-05	4.14.20	0942	GW	JHC-MW-15010	--	5	X	X	X	X						
-06	4.15.20	0936	GW	JHC-MW-15011	--	10	X	X	X	X	X	X	X	X	Nitrates / Sulfide	
-07	4.14.20	1036	GW	DUP-02	--	5	X	X	X	X						
-08	4.14.20	0946	GW	EB-02	--	5	X	X	X	X						
-09	4.14.20	1506	GW	FB-02	--	5	X	X	X	X						
-10	4.14.20	1212	GW	JHC-MW-15007 Field MS	--	2	X	X								
-11	4.14.20	1212	GW	JHC-MW-15007 Field MSD	--	2	X	X								

RELINQUISHED BY (SIGNATURE)	DATE/TIME	RECEIVED BY (SIGNATURE)	COMMENTS
	4/16/20 834		
RELINQUISHED BY (SIGNATURE)	DATE/TIME	RECEIVED BY (SIGNATURE)	3.3-5.0 on ice SW 04/16/20
	04-16/20 11:38		ORIGINAL TO LAB COPY TO CUSTOMER



Analytical Laboratory Report

Report ID: S13359.01(01)
Generated on 04/20/2020

Report to

Attention: Emil Blaj
Consumers Energy Company
135 West Trail Street
Jackson, MI 49201

Phone: D:517-788-5888 C:517-684-9467 FAX: 517-788-2533
Email: emil.blaj@cmsenergy.com

Report produced by

Merit Laboratories, Inc.
2680 East Lansing Drive
East Lansing, MI 48823

Phone: (517) 332-0167 FAX: (517) 332-6333

Contacts for report questions:

John Lavery (johnlavery@meritlabs.com)
Barbara Ball (bball@meritlabs.com)

Report Summary

Lab Sample ID(s): S13359.01-S13359.09
Project: JHC GW Monitoring Q2
Collected Date(s): 04/15/2020 - 04/16/2020
Submitted Date/Time: 04/17/2020 16:40
Sampled by: CET / CLH / DHW
P.O. #: 4400088825

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Maya Murshak
Technical Director



Analytical Laboratory Report

General Report Notes

Analytical results relate only to the samples tested, in the condition received by the laboratory.

Methods may be modified for improved performance.

Results reported on a dry weight basis where applicable.

'Not detected' indicates that parameter was not found at a level equal to or greater than the reporting limit (RL).

40 CFR Part 136 Table II Required Containers, Preservation Techniques and Holding Times for the Clean Water Act specify that samples for acrolein and acrylonitrile need to be preserved at a pH in the range of 4 to 5 or if not preserved, analyzed within 3 days of sampling.

QA/QC corresponding to this analytical report is a separate document with the same Merit ID reference and is available upon request.

Full accreditation certificates are available upon request. Starred (*) analytes are not NELAP accredited.

Samples are held by the lab for 30 days from the final report date unless a written request to hold longer is provided by the client.

Report shall not be reproduced except in full, without the written approval of Merit Laboratories, Inc.

Limits for drinking water samples, are listed as the MCL Limits (Maximum Contaminant Level Concentrations)

Report Narrative

There is no additional narrative for this analytical report



Analytical Laboratory Report

Laboratory Certifications

Authority	Certification ID
Michigan DEQ	#9956
DOD ELAP/ISO 17025	#69699
WBENC	#2005110032
Ohio VAP	#CL0002
Indiana DOH	#C-MI-07
New York NELAC	#11814
North Carolina DENR	#680
North Carolina DOH	#26702
Alaska CSLAP	#17-001

Qualifier Descriptions

Qualifier	Description
!	Result is outside of stated limit criteria
B	Compound also found in associated method blank
E	Concentration exceeds calibration range
F	Analysis run outside of holding time
G	Estimated result due to extraction run outside of holding time
H	Sample submitted and run outside of holding time
I	Matrix interference with internal standard
J	Estimated value less than reporting limit, but greater than MDL
L	Elevated reporting limit due to low sample amount
M	Result reported to MDL not RDL
O	Analysis performed by outside laboratory. See attached report.
R	Preliminary result
S	Surrogate recovery outside of control limits
T	No correction for total solids
X	Elevated reporting limit due to matrix interference
Y	Elevated reporting limit due to high target concentration
b	Value detected less than reporting limit, but greater than MDL
e	Reported value estimated due to interference
j	Analyte also found in associated method blank
p	Benzo(b)Fluoranthene and Benzo(k)Fluoranthene integrated as one peak.
x	Preserved from bulk sample

Glossary of Abbreviations

Abbreviation	Description
RL/RDL	Reporting Limit
MDL	Method Detection Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
SW	EPA SW 846 (Soil and Wastewater) Methods
E	EPA Methods
SM	Standard Methods
LN	Linear
BR	Branched



Analytical Laboratory Report

Method Summary

Method	Version
SM4500-S2 D	Standard Method 4450 S2 D 2011



Analytical Laboratory Report

Sample Summary (9 samples)

Sample ID	Sample Tag	Matrix	Collected Date/Time
S13359.01	20-0384-06 JHC-MW-15011	Groundwater	04/15/20 09:36
S13359.02	20-0395-01 JHC-MW-15024	Groundwater	04/16/20 10:44
S13359.03	20-0395-02 JHC-MW-15025	Groundwater	04/16/20 11:58
S13359.04	20-0395-03 JHC-MW-15027	Groundwater	04/16/20 14:35
S13359.05	20-0398-01 JHC-MW-15013	Groundwater	04/16/20 12:58
S13359.06	20-0398-02 JHC-MW-15015	Groundwater	04/16/20 10:16
S13359.07	20-0397-01 JHC-MW-15002	Groundwater	04/16/20 17:23
S13359.08	20-0397-02 JHC-MW-15005	Groundwater	04/16/20 18:11
S13359.09	20-0397-03 JHC-MW-18005	Groundwater	04/16/20 17:01



Analytical Laboratory Report

Lab Sample ID: S13359.01

Sample Tag: 20-0384-06 JHC-MW-15011

Collected Date/Time: 04/15/2020 09:36

Matrix: Groundwater

COC Reference: 134191

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
1	125ml Plastic	NaOH	Yes	5.3	IR

Inorganics

Method: SM4500-S2 D, Run Date: 04/20/20 13:22, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Sulfide	Not detected	0.04	0.010	mg/L	2	18496-25-8	



Analytical Laboratory Report

Lab Sample ID: S13359.02

Sample Tag: 20-0395-01 JHC-MW-15024

Collected Date/Time: 04/16/2020 10:44

Matrix: Groundwater

COC Reference: 134191

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
1	125ml Plastic	NaOH	Yes	5.3	IR

Inorganics

Method: SM4500-S2 D, Run Date: 04/20/20 13:24, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Sulfide	Not detected	0.04	0.010	mg/L	2	18496-25-8	



Analytical Laboratory Report

Lab Sample ID: S13359.03

Sample Tag: 20-0395-02 JHC-MW-15025

Collected Date/Time: 04/16/2020 11:58

Matrix: Groundwater

COC Reference: 134191

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
1	125ml Plastic	NaOH	Yes	5.3	IR

Inorganics

Method: SM4500-S2 D, Run Date: 04/20/20 13:26, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Sulfide	Not detected	0.04	0.010	mg/L	2	18496-25-8	



Analytical Laboratory Report

Lab Sample ID: S13359.04

Sample Tag: 20-0395-03 JHC-MW-15027

Collected Date/Time: 04/16/2020 14:35

Matrix: Groundwater

COC Reference: 134191

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
1	125ml Plastic	NaOH	Yes	5.3	IR

Inorganics

Method: SM4500-S2 D, Run Date: 04/20/20 13:28, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Sulfide	Not detected	0.04	0.010	mg/L	2	18496-25-8	



Analytical Laboratory Report

Lab Sample ID: S13359.05

Sample Tag: 20-0398-01 JHC-MW-15013

Collected Date/Time: 04/16/2020 12:58

Matrix: Groundwater

COC Reference: 134191

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
1	125ml Plastic	NaOH	Yes	5.3	IR

Inorganics

Method: SM4500-S2 D, Run Date: 04/20/20 13:30, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Sulfide	Not detected	0.04	0.010	mg/L	2	18496-25-8	



Analytical Laboratory Report

Lab Sample ID: S13359.06

Sample Tag: 20-0398-02 JHC-MW-15015

Collected Date/Time: 04/16/2020 10:16

Matrix: Groundwater

COC Reference: 134191

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
1	125ml Plastic	NaOH	Yes	5.3	IR

Inorganics

Method: SM4500-S2 D, Run Date: 04/20/20 13:34, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Sulfide	0.14	0.04	0.010	mg/L	2	18496-25-8	



Analytical Laboratory Report

Lab Sample ID: S13359.07

Sample Tag: 20-0397-01 JHC-MW-15002

Collected Date/Time: 04/16/2020 17:23

Matrix: Groundwater

COC Reference: 134191

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
1	125ml Plastic	NaOH	Yes	5.3	IR

Inorganics

Method: SM4500-S2 D, Run Date: 04/20/20 13:36, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Sulfide	0.06	0.04	0.010	mg/L	2	18496-25-8	



Analytical Laboratory Report

Lab Sample ID: S13359.08

Sample Tag: 20-0397-02 JHC-MW-15005

Collected Date/Time: 04/16/2020 18:11

Matrix: Groundwater

COC Reference: 134191

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
1	125ml Plastic	NaOH	Yes	5.3	IR

Inorganics

Method: SM4500-S2 D, Run Date: 04/20/20 13:38, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Sulfide	Not detected	0.04	0.010	mg/L	2	18496-25-8	



Analytical Laboratory Report

Lab Sample ID: S13359.09

Sample Tag: 20-0397-03 JHC-MW-18005

Collected Date/Time: 04/16/2020 17:01

Matrix: Groundwater

COC Reference: 134191

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
1	125ml Plastic	NaOH	Yes	5.3	IR

Inorganics

Method: SM4500-S2 D, Run Date: 04/20/20 13:40, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Sulfide	Not detected	0.04	0.010	mg/L	2	18496-25-8	

Merit Laboratories Login Checklist

Lab Set ID:S13359

Client:CONSUMERS (Consumers Energy)

Project: JHC GW Monitoring Q2

Submitted:04/17/2020 16:40 Login User: MMC

Attention: Emil Blaj

Address: Consumers Energy Company
135 West Trail Street
Jackson, MI 49201

Phone: D:517-788-5888 FAX:517-788-2533

Email:emil.blaj@cmsenergy.com

Selection	Description	Note
-----------	-------------	------

Sample Receiving

- | | | |
|-----|--|--|
| 01. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Samples are received at 4C +/- 2C Thermometer # IR 5.3 |
| 02. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Received on ice/ cooling process begun |
| 03. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Samples shipped |
| 04. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Samples left in 24 hr. drop box |
| 05. | <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A | Are there custody seals/tape or is the drop box locked |

Chain of Custody

- | | | |
|-----|--|--|
| 06. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | COC adequately filled out |
| 07. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | COC signed and relinquished to the lab |
| 08. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Sample tag on bottles match COC |
| 09. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Subcontracting needed? Subcontracted to: |

Preservation

- | | | |
|-----|--|---|
| 10. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Do sample have correct chemical preservation |
| 11. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Completed pH checks on preserved samples? (no VOAs) |
| 12. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Did any samples need to be preserved in the lab? |

Bottle Conditions

- | | | |
|-----|--|---|
| 13. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | All bottles intact |
| 14. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Appropriate analytical bottles are used |
| 15. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Merit bottles used |
| 16. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Sufficient sample volume received |
| 17. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Samples require laboratory filtration |
| 18. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Samples submitted within holding time |
| 19. | <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A | Do water VOC or TOX bottles contain headspace |

Corrective action for all exceptions is to call the client and to notify the project manager.

Client Review By: _____ Date: _____

Merit Laboratories Bottle Preservation Check

Lab Set ID: S13359 Initials: MMC

Client: CONSUMERS (Consumers Energy)

Project: JHC GW Monitoring Q2

Submitted: 04/17/2020 16:40 Login User:

Attention: Emil Blaj
 Address: Consumers Energy Company
 135 West Trail Street
 Jackson, MI 49201

Phone: D:517-788-5888 FAX: 517-788-2533
 Email: emil.blaj@cmsenergy.com

Lab ID	125 ml Plastic HNO ₃	250 ml Plastic HNO ₃	1 L Plastic HNO ₃	250 ml Plastic H ₂ SO ₄	125 ml Amber H ₂ SO ₄	32 oz Glass HCl	125 ml Plastic NaOH	125 ml Amber PbCO ₃ NaOH	pH					Notes	
									<2	>12	other	ml add	new pH		
S13359.01							X			X					
S13359.02							X			X					
S13359.03							X			X					
S13359.04							X			X					
S13359.05							X			X					
S13359.06							X			X					
S13359.07							X			X					
S13359.08							X			X					
S13359.09							X			X					

ANALYTICAL REPORT

Eurofins TestAmerica, St. Louis
13715 Rider Trail North
Earth City, MO 63045
Tel: (314)298-8566

Laboratory Job ID: 160-37917-1
Client Project/Site: JH Campbell Pond A Wells

For:
Consumers Energy
135 W Trail Street
Jackson, Michigan 49201

Attn: Emil Blaj



*Authorized for release by:
5/25/2020 8:41:06 PM*

Jayna Awalt, Project Manager II
(314)298-8566
jayna.awalt@testamericainc.com

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www.eurofinsus.com/Env

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.



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Case Narrative

Client: Consumers Energy
Project/Site: JH Campbell Pond A Wells

Job ID: 160-37917-1

Job ID: 160-37917-1

Laboratory: Eurofins TestAmerica, St. Louis

Narrative

CASE NARRATIVE

Client: Consumers Energy

Project: JH Campbell Pond A Wells

Report Number: 160-37917-1

With the exceptions noted as flags or footnotes, standard analytical protocols were followed in the analysis of the samples and no problems were encountered or anomalies observed. In addition all laboratory quality control samples were within established control limits, with any exceptions noted below. Each sample was analyzed to achieve the lowest possible reporting limit within the constraints of the method. In some cases, due to interference or analytes present at high concentrations, samples were diluted. For diluted samples, the reporting limits are adjusted relative to the dilution required.

Eurofins TestAmerica, St. Louis attests to the validity of the laboratory data generated by Eurofins TestAmerica facilities reported herein. All analyses performed by Eurofins TestAmerica facilities were done using established laboratory SOPs that incorporate QA/QC procedures described in the application methods. Eurofins TestAmerica's operations groups have reviewed the data for compliance with the laboratory QA/QC plan, and data have been found to be compliant with laboratory protocols unless otherwise noted below.

The test results in this report meet all NELAP requirements for parameters for which accreditation is required or available. Any exceptions to NELAP requirements are noted in this report. Pursuant to NELAP, this report may not be reproduced, except in full, without the written approval of the laboratory.

Calculations are performed before rounding to avoid round-off errors in calculated results.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the individual sections below.

All solid sample results for Chemistry analyses are reported on an "as received" basis unless otherwise indicated by the presence of a % solids value in the method header. All soil/sediment sample results for radiochemistry analyses are based upon sample as dried and disaggregated with the exception of tritium, carbon-14, and iodine-129 by gamma spectroscopy unless requested as wet weight by the client."

Any minimum detectable concentration (MDC), critical value (DLC), or Safe Drinking Water Act detection limit (SDWA DL) is sample-specific unless otherwise stated elsewhere in this narrative.

Reference the chain of custody and condition upon receipt report for any variations on receipt conditions and temperature of samples on receipt.

Manual Integrations were performed only when necessary and are in compliance with the laboratory's standard operating procedure. Detailed information can be found in the raw data section of the level IV report.

This laboratory report is confidential and is intended for the sole use of Eurofins TestAmerica and its client.

RECEIPT

The samples were received on 4/29/2020 9:21 AM; the samples arrived in good condition, properly preserved. The temperatures of the 6 coolers at receipt time were 20.0°C, 20.2°C, 20.6°C, 21.0°C, 21.4°C and 22.2°C

RADIUM 226 AS TOTAL ALPHA RADIUM

Samples JHC-MW-15006 (160-37917-1), JHC-MW-15007 (160-37917-2), JHC-MW-15008R (160-37917-3), JHC-MW-15009 (160-37917-4), JHC-MW-15010 (160-37917-5), JHC-MW-15011 (160-37917-6), DUP-02 (160-37917-7), EB-02 (160-37917-8) and FB-02

Case Narrative

Client: Consumers Energy
Project/Site: JH Campbell Pond A Wells

Job ID: 160-37917-1

Job ID: 160-37917-1 (Continued)

Laboratory: Eurofins TestAmerica, St. Louis (Continued)

(160-37917-9) were analyzed for Radium 226 as Total Alpha Radium in accordance with EPA 903.0_Total Alpha Radium. The samples were prepared on 05/11/2020 and analyzed on 05/21/2020.

Insufficient sample volume was available to perform a sample duplicate for the following samples: JHC-MW-15006 (160-37917-1), JHC-MW-15007 (160-37917-2), JHC-MW-15008R (160-37917-3), JHC-MW-15009 (160-37917-4), JHC-MW-15010 (160-37917-5), JHC-MW-15011 (160-37917-6), DUP-02 (160-37917-7), EB-02 (160-37917-8) and FB-02 (160-37917-9). A laboratory control sample/ laboratory control sample duplicate (LCS/LCSD) was prepared to demonstrate batch precision.

Ra-226 is reported without a 21-day waiting period to ensure short-lived alpha-emitting radium isotopes (e.g. Ra-224) have decayed out. The Ra-226 result should be considered to be potentially high biased. Associated samples have activity below the RL. The results are reported with this narrative. JHC-MW-15006 (160-37917-1), JHC-MW-15007 (160-37917-2), JHC-MW-15008R (160-37917-3), JHC-MW-15009 (160-37917-4), JHC-MW-15010 (160-37917-5), JHC-MW-15011 (160-37917-6), DUP-02 (160-37917-7), EB-02 (160-37917-8), FB-02 (160-37917-9), (LCS 160-470026/1-A), (LCSD 160-470026/2-A) and (MB 160-470026/24-A)

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

RADIUM-228 (GFPC)

Samples JHC-MW-15006 (160-37917-1), JHC-MW-15007 (160-37917-2), JHC-MW-15008R (160-37917-3), JHC-MW-15009 (160-37917-4), JHC-MW-15010 (160-37917-5), JHC-MW-15011 (160-37917-6), DUP-02 (160-37917-7), EB-02 (160-37917-8) and FB-02 (160-37917-9) were analyzed for Radium-228 (GFPC) in accordance with EPA 904. The samples were prepared on 05/11/2020 and analyzed on 05/18/2020.

Insufficient sample volume was available to perform a sample duplicate for the following samples: JHC-MW-15006 (160-37917-1), JHC-MW-15007 (160-37917-2), JHC-MW-15008R (160-37917-3), JHC-MW-15009 (160-37917-4), JHC-MW-15010 (160-37917-5), JHC-MW-15011 (160-37917-6), DUP-02 (160-37917-7), EB-02 (160-37917-8) and FB-02 (160-37917-9). A laboratory control sample/ laboratory control sample duplicate (LCS/LCSD) was prepared to demonstrate batch precision.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

COMBINED RADIUM-226 AND RADIUM-228

Samples JHC-MW-15006 (160-37917-1), JHC-MW-15007 (160-37917-2), JHC-MW-15008R (160-37917-3), JHC-MW-15009 (160-37917-4), JHC-MW-15010 (160-37917-5), JHC-MW-15011 (160-37917-6), DUP-02 (160-37917-7), EB-02 (160-37917-8) and FB-02 (160-37917-9) were analyzed for Combined Radium-226 and Radium-228 in accordance with EPA 903 Radium 226/EPA 904 Radium 228. The samples were analyzed on 05/22/2020.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Chain of Custody Record



Environment Testing
TestAmerica

TestAmerica Laboratories, Inc. d/b/a Eurofins TestAmerica

Regulatory Program: DW NPDES RCRA Other:

Project Manager: Emil Blaj

Email: Emil.Blaj@cmsenergy.com
Tel/Fax: 517-788-5888

Analysis Turnaround Time
 CALENDAR DAYS WORKING DAYS
TAT if different from Below
 2 weeks
 1 week
 2 days
 1 day

Client Contact
Consumers Energy, Laboratory Services
135 W. Trail Street
Jackson, MI 49201
517-788-5888
(xxx) xxx-xxxx FAX
Project Name: JH Campbell Pond A Wells
20-0384
P O #

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Preservative	Perform MS/MSD (Y/N)	Radium 226 (EPA 903.1)	Radium 228 (EPA 904.0)
JHC-MW-15006	4/14/20	1501	G	GW	2		N	X	X
JHC-MW-150047	4/14/20	1212	G	GW	2		N	X	X
JHC-MW-15008R	4/14/20	1126	G	GW	2		N	X	X
JHC-MW-15009	4/14/20	1036	G	GW	2		N	X	X
JHC-MW-15010	4/14/20	0942	G	GW	2		N	X	X
JHC-MW-15011	4/15/20	0936	G	GW	2		N	X	X
DUP-02	4/14/20	1036	G	GW	2		N	X	X
EB-02	4/14/20	0946	G	DI	2		N	X	X
FB-02	4/14/20	1506	G	DI	2		N	X	X



Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other

Possible Hazard Identification: Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample.

Special Instructions/QC Requirements & Comments:
 Non-Hazard Flammable Skin Irritant Poison B Unknown
 Return to Client Disposal by Lab Archive for _____ Months

Custody Seals Intact: <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Custody Seal No.:	Cooler Temp. (°C):	Obs'd:	Corr'd:	Therm ID No.:
Relinquished by: <i>Cassidy Hampton</i>	Company: <i>CE Lab</i>	Received by: <i>VPS</i>	Company:	Received by: <i>VPS</i>	Date/Time: <i>4/14/20</i>
Relinquished by: <i>UPS</i>	Company:	Received by: <i>Emil Blaj</i>	Company: <i>EIA STL</i>	Received by: <i>Emil Blaj</i>	Date/Time: <i>4/29/2020 0921</i>
Relinquished by:	Company:	Received in Laboratory by:	Company:	Received in Laboratory by:	Date/Time:



TestAmerica Michigan
10448 Citation Drive, Ste 200
Brighton, MI 48116

PROCUREMENT #: 20040554

QA Code: NQ

(Item 1) - Part Number: N/A - Quantity : 1
JHC CCR Rule GW Q2-2020 Samples

Groundwater Samples for Radium 226 (EPA 903.1) and Radium 228 (EPA 904.0)

Standard TAT Request.

Reference Quote #16009066-0

(Item 2) - Part Number: NA - Quantity : 1

Please include Consumers Energy Project Number and Procurement Number on all submitted invoices

For technical questions, please contact Emil Blaj at 517-788-5888, or Emil.Blaj@cmsenergy.com.

To expedite payment please provide the Procurement number on all invoices.

Send Invoices To:

Consumers Energy Company
Attn: Accounts Payable
135 W Trail St.
Jackson, MI 49201

Login Sample Receipt Checklist

Client: Consumers Energy

Job Number: 160-37917-1

Login Number: 37917

List Source: Eurofins TestAmerica, St. Louis

List Number: 1

Creator: Lambert-Sykes, Chenise Y

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	N/A	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	False	The client has confirmed that sample -2 should be listed as JHC-MW-15007
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Definitions/Glossary

Client: Consumers Energy
Project/Site: JH Campbell Pond A Wells

Job ID: 160-37917-1

Qualifiers

Rad

Qualifier	Qualifier Description
U	Result is less than the sample detection limit.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
α	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Method Summary

Client: Consumers Energy
Project/Site: JH Campbell Pond A Wells

Job ID: 160-37917-1

Method	Method Description	Protocol	Laboratory
903.0	Radium-226 (GFPC)	EPA	TAL SL
904.0	Radium-228 (GFPC)	EPA	TAL SL
Ra226_Ra228	Combined Radium-226 and Radium-228	TAL-STL	TAL SL
PrecSep STD	Preparation, Precipitate Separation (Standard In-Growth)	None	TAL SL
PrecSep_0	Preparation, Precipitate Separation	None	TAL SL

Protocol References:

EPA = US Environmental Protection Agency

None = None

TAL-STL = TestAmerica Laboratories, St. Louis, Facility Standard Operating Procedure.

Laboratory References:

TAL SL = Eurofins TestAmerica, St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566



Sample Summary

Client: Consumers Energy
Project/Site: JH Campbell Pond A Wells

Job ID: 160-37917-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received	Asset ID
160-37917-1	JHC-MW-15006	Water	04/14/20 15:01	04/29/20 09:21	
160-37917-2	JHC-MW-15007	Water	04/14/20 12:12	04/29/20 09:21	
160-37917-3	JHC-MW-15008R	Water	04/14/20 11:26	04/29/20 09:21	
160-37917-4	JHC-MW-15009	Water	04/14/20 10:36	04/29/20 09:21	
160-37917-5	JHC-MW-15010	Water	04/14/20 09:42	04/29/20 09:21	
160-37917-6	JHC-MW-15011	Water	04/15/20 09:36	04/29/20 09:21	
160-37917-7	DUP-02	Water	04/14/20 10:36	04/29/20 09:21	
160-37917-8	EB-02	Water	04/14/20 09:46	04/29/20 09:21	
160-37917-9	FB-02	Water	04/14/20 15:06	04/29/20 09:21	

Client Sample Results

Client: Consumers Energy
Project/Site: JH Campbell Pond A Wells

Job ID: 160-37917-1

Client Sample ID: JHC-MW-15006

Lab Sample ID: 160-37917-1

Date Collected: 04/14/20 15:01

Matrix: Water

Date Received: 04/29/20 09:21

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.426		0.170	0.174	1.00	0.185	pCi/L	05/11/20 17:01	05/21/20 16:03	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	85.8		40 - 110					05/11/20 17:01	05/21/20 16:03	1

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.518		0.297	0.301	1.00	0.450	pCi/L	05/11/20 17:18	05/18/20 15:04	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	85.8		40 - 110					05/11/20 17:18	05/18/20 15:04	1
Y Carrier	87.9		40 - 110					05/11/20 17:18	05/18/20 15:04	1

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.944		0.342	0.348	5.00	0.450	pCi/L		05/22/20 07:53	1

Client Sample ID: JHC-MW-15007

Lab Sample ID: 160-37917-2

Date Collected: 04/14/20 12:12

Matrix: Water

Date Received: 04/29/20 09:21

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.197		0.128	0.129	1.00	0.178	pCi/L	05/11/20 17:01	05/21/20 16:03	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	98.8		40 - 110					05/11/20 17:01	05/21/20 16:03	1

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.234	U	0.276	0.277	1.00	0.456	pCi/L	05/11/20 17:18	05/18/20 15:09	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	98.8		40 - 110					05/11/20 17:18	05/18/20 15:09	1
Y Carrier	88.2		40 - 110					05/11/20 17:18	05/18/20 15:09	1

Client Sample Results

Client: Consumers Energy
Project/Site: JH Campbell Pond A Wells

Job ID: 160-37917-1

Client Sample ID: JHC-MW-15007

Lab Sample ID: 160-37917-2

Date Collected: 04/14/20 12:12

Matrix: Water

Date Received: 04/29/20 09:21

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.431	U	0.304	0.306	5.00	0.456	pCi/L		05/22/20 07:53	1

Client Sample ID: JHC-MW-15008R

Lab Sample ID: 160-37917-3

Date Collected: 04/14/20 11:26

Matrix: Water

Date Received: 04/29/20 09:21

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.180		0.115	0.116	1.00	0.158	pCi/L	05/11/20 17:01	05/21/20 22:53	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	101		40 - 110					05/11/20 17:01	05/21/20 22:53	1

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.369	U	0.272	0.274	1.00	0.429	pCi/L	05/11/20 17:18	05/18/20 15:09	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	101		40 - 110					05/11/20 17:18	05/18/20 15:09	1
Y Carrier	87.1		40 - 110					05/11/20 17:18	05/18/20 15:09	1

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.549		0.295	0.298	5.00	0.429	pCi/L		05/22/20 07:53	1

Client Sample ID: JHC-MW-15009

Lab Sample ID: 160-37917-4

Date Collected: 04/14/20 10:36

Matrix: Water

Date Received: 04/29/20 09:21

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.394		0.143	0.148	1.00	0.147	pCi/L	05/11/20 17:01	05/21/20 22:53	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	101		40 - 110					05/11/20 17:01	05/21/20 22:53	1

Client Sample Results

Client: Consumers Energy
Project/Site: JH Campbell Pond A Wells

Job ID: 160-37917-1

Client Sample ID: JHC-MW-15009

Lab Sample ID: 160-37917-4

Date Collected: 04/14/20 10:36

Matrix: Water

Date Received: 04/29/20 09:21

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.573		0.320	0.324	1.00	0.490	pCi/L	05/11/20 17:18	05/18/20 15:09	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	101		40 - 110					05/11/20 17:18	05/18/20 15:09	1
Y Carrier	82.2		40 - 110					05/11/20 17:18	05/18/20 15:09	1

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.967		0.350	0.356	5.00	0.490	pCi/L		05/22/20 07:53	1

Client Sample ID: JHC-MW-15010

Lab Sample ID: 160-37917-5

Date Collected: 04/14/20 09:42

Matrix: Water

Date Received: 04/29/20 09:21

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.270		0.124	0.126	1.00	0.140	pCi/L	05/11/20 17:01	05/21/20 22:54	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	97.0		40 - 110					05/11/20 17:01	05/21/20 22:54	1

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.752		0.324	0.331	1.00	0.475	pCi/L	05/11/20 17:18	05/18/20 15:09	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	97.0		40 - 110					05/11/20 17:18	05/18/20 15:09	1
Y Carrier	87.5		40 - 110					05/11/20 17:18	05/18/20 15:09	1

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	1.02		0.347	0.354	5.00	0.475	pCi/L		05/22/20 07:53	1

Client Sample Results

Client: Consumers Energy
Project/Site: JH Campbell Pond A Wells

Job ID: 160-37917-1

Client Sample ID: JHC-MW-15011

Lab Sample ID: 160-37917-6

Date Collected: 04/15/20 09:36

Matrix: Water

Date Received: 04/29/20 09:21

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.242		0.116	0.118	1.00	0.127	pCi/L	05/11/20 17:01	05/21/20 22:54	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	95.5		40 - 110					05/11/20 17:01	05/21/20 22:54	1

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.606		0.280	0.286	1.00	0.408	pCi/L	05/11/20 17:18	05/18/20 15:09	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	95.5		40 - 110					05/11/20 17:18	05/18/20 15:09	1
Y Carrier	89.0		40 - 110					05/11/20 17:18	05/18/20 15:09	1

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.848		0.303	0.309	5.00	0.408	pCi/L		05/22/20 07:53	1

Client Sample ID: DUP-02

Lab Sample ID: 160-37917-7

Date Collected: 04/14/20 10:36

Matrix: Water

Date Received: 04/29/20 09:21

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.307		0.122	0.125	1.00	0.115	pCi/L	05/11/20 17:01	05/21/20 22:54	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	98.2		40 - 110					05/11/20 17:01	05/21/20 22:54	1

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.459		0.261	0.264	1.00	0.393	pCi/L	05/11/20 17:18	05/18/20 15:09	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	98.2		40 - 110					05/11/20 17:18	05/18/20 15:09	1
Y Carrier	87.5		40 - 110					05/11/20 17:18	05/18/20 15:09	1

Client Sample Results

Client: Consumers Energy
Project/Site: JH Campbell Pond A Wells

Job ID: 160-37917-1

Client Sample ID: DUP-02

Date Collected: 04/14/20 10:36

Date Received: 04/29/20 09:21

Lab Sample ID: 160-37917-7

Matrix: Water

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.767		0.288	0.292	5.00	0.393	pCi/L		05/22/20 07:53	1

Client Sample ID: EB-02

Date Collected: 04/14/20 09:46

Date Received: 04/29/20 09:21

Lab Sample ID: 160-37917-8

Matrix: Water

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	-0.0130	U	0.0942	0.0942	1.00	0.192	pCi/L	05/11/20 17:01	05/21/20 22:54	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	96.4		40 - 110					05/11/20 17:01	05/21/20 22:54	1

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.329	U	0.290	0.292	1.00	0.467	pCi/L	05/11/20 17:18	05/18/20 15:09	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	96.4		40 - 110					05/11/20 17:18	05/18/20 15:09	1
Y Carrier	86.4		40 - 110					05/11/20 17:18	05/18/20 15:09	1

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.316	U	0.305	0.307	5.00	0.467	pCi/L		05/22/20 07:53	1

Client Sample ID: FB-02

Date Collected: 04/14/20 15:06

Date Received: 04/29/20 09:21

Lab Sample ID: 160-37917-9

Matrix: Water

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	-0.00386	U	0.0575	0.0575	1.00	0.126	pCi/L	05/11/20 17:01	05/21/20 22:54	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	97.3		40 - 110					05/11/20 17:01	05/21/20 22:54	1

Client Sample Results

Client: Consumers Energy
 Project/Site: JH Campbell Pond A Wells

Job ID: 160-37917-1

Client Sample ID: FB-02

Lab Sample ID: 160-37917-9

Date Collected: 04/14/20 15:06

Matrix: Water

Date Received: 04/29/20 09:21

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.0848	U	0.238	0.238	1.00	0.411	pCi/L	05/11/20 17:18	05/18/20 15:09	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	97.3		40 - 110					05/11/20 17:18	05/18/20 15:09	1
Y Carrier	89.7		40 - 110					05/11/20 17:18	05/18/20 15:09	1

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.0810	U	0.245	0.245	5.00	0.411	pCi/L		05/22/20 07:53	1



QC Sample Results

Client: Consumers Energy
Project/Site: JH Campbell Pond A Wells

Job ID: 160-37917-1

Method: 903.0 - Radium-226 (GFPC)

Lab Sample ID: MB 160-470026/24-A
Matrix: Water
Analysis Batch: 471038

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 470026

Analyte	MB MB		Count	Total	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
	Result	Qualifier	Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Radium-226	0.09078	U	0.0982	0.0986	1.00	0.157	pCi/L	05/11/20 17:01	05/21/20 22:54	1
Carrier	MB MB		Limits			Prepared	Analyzed	Dil Fac		
	%Yield	Qualifier								
Ba Carrier	98.2		40 - 110			05/11/20 17:01	05/21/20 22:54	1		

Lab Sample ID: LCS 160-470026/1-A
Matrix: Water
Analysis Batch: 471038

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 470026

Analyte	Spike Added	LCS Result	LCS Qual	Total	RL	MDC	Unit	%Rec	%Rec. Limits
				Uncert. (2σ+/-)					
Radium-226	11.3	10.98		1.20	1.00	0.159	pCi/L	97	75 - 125
Carrier	LCS %Yield	LCS Qualifier	Limits						
Ba Carrier	99.1		40 - 110						

Lab Sample ID: LCSD 160-470026/2-A
Matrix: Water
Analysis Batch: 471038

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 470026

Analyte	Spike Added	LCSD Result	LCSD Qual	Total	RL	MDC	Unit	%Rec	%Rec. Limits	RER	RER
				Uncert. (2σ+/-)							Limit
Radium-226	11.3	11.91		1.28	1.00	0.152	pCi/L	105	75 - 125	0.37	1
Carrier	LCSD %Yield	LCSD Qualifier	Limits								
Ba Carrier	99.4		40 - 110								

Method: 904.0 - Radium-228 (GFPC)

Lab Sample ID: MB 160-470027/24-A
Matrix: Water
Analysis Batch: 470670

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 470027

Analyte	MB MB		Count	Total	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
	Result	Qualifier	Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Radium-228	0.01987	U	0.221	0.221	1.00	0.394	pCi/L	05/11/20 17:18	05/18/20 15:09	1
Carrier	MB MB		Limits			Prepared	Analyzed	Dil Fac		
	%Yield	Qualifier								
Ba Carrier	98.2		40 - 110			05/11/20 17:18	05/18/20 15:09	1		
Y Carrier	87.1		40 - 110			05/11/20 17:18	05/18/20 15:09	1		

QC Sample Results

Client: Consumers Energy
 Project/Site: JH Campbell Pond A Wells

Job ID: 160-37917-1

Method: 904.0 - Radium-228 (GFPC) (Continued)

Lab Sample ID: LCS 160-470027/1-A
Matrix: Water
Analysis Batch: 470671

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 470027

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits
Radium-228	8.83	7.418		0.907	1.00	0.394	pCi/L	84	75 - 125

Carrier	LCS %Yield	LCS Qualifier	Limits
Ba Carrier	99.1		40 - 110
Y Carrier	86.7		40 - 110

Lab Sample ID: LCSD 160-470027/2-A
Matrix: Water
Analysis Batch: 470671

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 470027

Analyte	Spike Added	LCSD Result	LCSD Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits	RER	RER Limit
Radium-228	8.83	7.125		0.881	1.00	0.388	pCi/L	81	75 - 125	0.16	1

Carrier	LCSD %Yield	LCSD Qualifier	Limits
Ba Carrier	99.4		40 - 110
Y Carrier	86.0		40 - 110

QC Association Summary

Client: Consumers Energy
 Project/Site: JH Campbell Pond A Wells

Job ID: 160-37917-1

Rad

Prep Batch: 470026

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-37917-1	JHC-MW-15006	Total/NA	Water	PrecSep STD	
160-37917-2	JHC-MW-15007	Total/NA	Water	PrecSep STD	
160-37917-3	JHC-MW-15008R	Total/NA	Water	PrecSep STD	
160-37917-4	JHC-MW-15009	Total/NA	Water	PrecSep STD	
160-37917-5	JHC-MW-15010	Total/NA	Water	PrecSep STD	
160-37917-6	JHC-MW-15011	Total/NA	Water	PrecSep STD	
160-37917-7	DUP-02	Total/NA	Water	PrecSep STD	
160-37917-8	EB-02	Total/NA	Water	PrecSep STD	
160-37917-9	FB-02	Total/NA	Water	PrecSep STD	
MB 160-470026/24-A	Method Blank	Total/NA	Water	PrecSep STD	
LCS 160-470026/1-A	Lab Control Sample	Total/NA	Water	PrecSep STD	
LCSD 160-470026/2-A	Lab Control Sample Dup	Total/NA	Water	PrecSep STD	

Prep Batch: 470027

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-37917-1	JHC-MW-15006	Total/NA	Water	PrecSep_0	
160-37917-2	JHC-MW-15007	Total/NA	Water	PrecSep_0	
160-37917-3	JHC-MW-15008R	Total/NA	Water	PrecSep_0	
160-37917-4	JHC-MW-15009	Total/NA	Water	PrecSep_0	
160-37917-5	JHC-MW-15010	Total/NA	Water	PrecSep_0	
160-37917-6	JHC-MW-15011	Total/NA	Water	PrecSep_0	
160-37917-7	DUP-02	Total/NA	Water	PrecSep_0	
160-37917-8	EB-02	Total/NA	Water	PrecSep_0	
160-37917-9	FB-02	Total/NA	Water	PrecSep_0	
MB 160-470027/24-A	Method Blank	Total/NA	Water	PrecSep_0	
LCS 160-470027/1-A	Lab Control Sample	Total/NA	Water	PrecSep_0	
LCSD 160-470027/2-A	Lab Control Sample Dup	Total/NA	Water	PrecSep_0	

Tracer/Carrier Summary

Client: Consumers Energy
 Project/Site: JH Campbell Pond A Wells

Job ID: 160-37917-1

Method: 903.0 - Radium-226 (GFPC)

Matrix: Water

Prep Type: Total/NA

			Percent Yield (Acceptance Limits)			
Lab Sample ID	Client Sample ID	Ba Carrier (40-110)				
160-37917-1	JHC-MW-15006	85.8				
160-37917-2	JHC-MW-15007	98.8				
160-37917-3	JHC-MW-15008R	101				
160-37917-4	JHC-MW-15009	101				
160-37917-5	JHC-MW-15010	97.0				
160-37917-6	JHC-MW-15011	95.5				
160-37917-7	DUP-02	98.2				
160-37917-8	EB-02	96.4				
160-37917-9	FB-02	97.3				
LCS 160-470026/1-A	Lab Control Sample	99.1				
LCSD 160-470026/2-A	Lab Control Sample Dup	99.4				
MB 160-470026/24-A	Method Blank	98.2				
Tracer/Carrier Legend						
Ba Carrier = Ba Carrier						

Method: 904.0 - Radium-228 (GFPC)

Matrix: Water

Prep Type: Total/NA

					Percent Yield (Acceptance Limits)			
Lab Sample ID	Client Sample ID	Ba Carrier (40-110)	Y Carrier (40-110)					
160-37917-1	JHC-MW-15006	85.8	87.9					
160-37917-2	JHC-MW-15007	98.8	88.2					
160-37917-3	JHC-MW-15008R	101	87.1					
160-37917-4	JHC-MW-15009	101	82.2					
160-37917-5	JHC-MW-15010	97.0	87.5					
160-37917-6	JHC-MW-15011	95.5	89.0					
160-37917-7	DUP-02	98.2	87.5					
160-37917-8	EB-02	96.4	86.4					
160-37917-9	FB-02	97.3	89.7					
LCS 160-470027/1-A	Lab Control Sample	99.1	86.7					
LCSD 160-470027/2-A	Lab Control Sample Dup	99.4	86.0					
MB 160-470027/24-A	Method Blank	98.2	87.1					
Tracer/Carrier Legend								
Ba Carrier = Ba Carrier								
Y Carrier = Y Carrier								

To: KDStarken, JH Campbell Complex

From: EBlaj, T-258

Date: July 28, 2020

Subject: JH CAMPBELL SOLID WASTE DISPOSAL AREA – GROUNDWATER MONITORING
2nd Quarter, 2020 – Pond A AMP/GSI Wells

CC: BLSwanberg, P22-119
BTRunkel, P22-120
HDRegister, P22-521

Sarah Holmstrom, Project Manager
TRC Companies, Inc.
1540 Eisenhower Place
Ann Arbor, MI 48108

Chemistry Project: 20-0405R

CE Laboratory Services conducted groundwater monitoring on 04/13/2020 through 04/16/2020 at the JH Campbell Solid Waste Disposal Area, for the 2nd Quarter monitoring requirements. The samples were received in the Chemistry department on 04/17/2020.

Samples for Radium analysis have been subcontracted to Eurofins/TestAmerica, Inc. and their results are being reported separately. Please note that the subcontracted work is not reported under the CE laboratory scope of accreditation.

With the exception noted above, the report that follows presents the results of the requested analytical testing; the results apply only to the samples, as received. All samples have been analyzed in accordance with the 2009 TNI Standard and the applicable A2LA accreditation scope for Laboratory Services. Any exceptions to applicable test method criteria and standard compliance are noted in the Case Narrative, or flagged with applicable qualifiers in the analytical results section.

The original report has been revised to include only the required total metals list, all results remained unchanged.

Reviewed and approved by:

Emil Blaj
Sr. Technical Analyst
Project Lead



Testing performed in accordance with the A2LA scope of accreditation specified in the listed certificate. The information contained in this report is the sole property of Consumers Energy. It cannot be reproduced except in full, and with consent from Consumers Energy, or the customer for which this report was issued.

CASE NARRATIVE

I. Sample Receipt

All samples were received within hold time and in good conditions; no anomalies were noted on the Sample Log-In Shipment Inspection Form during sample check-in. Identification of all samples included in the work order/project is provided in the sample summary section. Sample preservation upon receipt was verified by the sample custodian and confirmed to meet method requirements.

NOTE: Sample temperature measured upon receipt was found above the recommended range of 0-6°C. During the time samples were kept on the bench they warmed up to 5.0-8.3°C.

II. Methodology

Unless otherwise indicated, sample preparation and analysis was performed in accordance with the corresponding test methods from “Methods for the Determination of Inorganic Substances in Environmental Samples (EPA/600/R-93/100); SW-846, “Test Methods for Evaluating Solid Waste – Physical/Chemical Methods”, USEPA (latest revisions), and Standard Methods for the Examination of Water and Wastewater, APHA-AWWA-WPCF, 22nd Edition, 2012.

III. Results/Quality Control

Analytical results for this report are presented by laboratory sample ID, container & aliquot number. Results for the field blanks, field duplicates, and percent recoveries of the field matrix spike & matrix spike duplicate samples are included in the results section. Unless specifically noted in the case narrative, all method quality control requirements have been met. If any results are qualified, the corresponding data flags/qualifiers are listed on the last page of the results section. Any additional information on method performance, when applicable, is presented in this section of the case narrative. When data flags are not needed, the qualifiers text box on the last page is left blank, and a statement confirms that no exceptions occurred.

DEFINITIONS / QUALIFIERS

The following qualifiers and/or acronyms are used in the report where applicable:

<u>Acronym</u>	<u>Description</u>
RL	Reporting Limit
ND	Result not detected or below Reporting Limit
NT	Not a TNI Analyte
LCS	Laboratory Control Sample
LRB	Laboratory Reagent Blank (also referred to as Method Blank)
DUP	Duplicate
MS	Matrix Spike
MSD	Matrix Spike Duplicate
RPD	Relative Percent Difference
MDL	Method Detection Limit
PQL	Practical Quantitation Limit
TDL	Target Detection Limit
SM	Standard Methods Compendium

<u>Qualifier</u>	<u>Description</u>
*	Generic data flag, applicable description added in the corresponding notes section
B	The analyte was detected in the LRB at a level which is significant relative to sample result
D	Reporting limit elevated due to dilution
E	Estimated due to result exceeding the linear range of the analyzer
H	The maximum recommended hold time was exceeded
I	Dilution required due to matrix interference; reporting limit elevated
J	Estimated due to result found above MDL but below PQL (or RL)
K	Reporting limit raised due to matrix interference
M	The precision for duplicate analysis was not met; RPD outside acceptance criteria
N	Non-homogeneous sample made analysis questionable
PI	Possible interference may have affected the accuracy of the laboratory result
Q	Matrix Spike or Matrix Spike Duplicate recovery outside acceptance criteria
R	Result confirmed by new sample preparation and reanalysis
X	Other notation required; comment listed in sample notes and/or case narrative

Work Order Sample Summary

Customer Name: JH Campbell Complex
Work Order ID: Q2 N&E AMP GSI Wells
Date Received: 4/17/2020
Chemistry Project: 20-0405

<u>Sample #</u>	<u>Field Sample ID</u>	<u>Matrix</u>	<u>Sample Date</u>	<u>Site</u>
20-0405-01	MW-14S	Groundwater	04/16/2020 03:36 PM	JHC RCRA GW Monitoring - N&E/AMP/GSI Wells
20-0405-02	PZ-24S	Groundwater	04/16/2020 02:33 PM	JHC RCRA GW Monitoring - N&E/AMP/GSI Wells
20-0405-03	PZ-40S	Groundwater	04/16/2020 11:02 AM	JHC RCRA GW Monitoring - N&E/AMP/GSI Wells
20-0405-04	TW-19-04A	Groundwater	04/14/2020 06:17 PM	JHC RCRA GW Monitoring - N&E/AMP/GSI Wells
20-0405-05	TW-19-05	Groundwater	04/16/2020 03:51 PM	JHC RCRA GW Monitoring - N&E/AMP/GSI Wells
20-0405-06	TW-19-06A	Groundwater	04/16/2020 04:06 PM	JHC RCRA GW Monitoring - N&E/AMP/GSI Wells
20-0405-07	PZ-23S	Groundwater	04/16/2020 04:52 PM	JHC RCRA GW Monitoring - N&E/AMP/GSI Wells
20-0405-08	PZ-24	Groundwater	04/16/2020 12:55 PM	JHC RCRA GW Monitoring - N&E/AMP/GSI Wells
20-0405-09	PZ-40	Groundwater	04/16/2020 09:38 AM	JHC RCRA GW Monitoring - N&E/AMP/GSI Wells
20-0405-10	DUP-05	Groundwater	04/16/2020 12:00 AM	JHC RCRA GW Monitoring - N&E/AMP/GSI Wells
20-0405-11	EB-05	Water	04/16/2020 06:25 PM	JHC RCRA GW Monitoring - N&E/AMP/GSI Wells
20-0405-12	FB-05	Water	04/16/2020 11:00 AM	JHC RCRA GW Monitoring - N&E/AMP/GSI Wells
20-0405-13	TW-19-04A Field MS	Groundwater	04/14/2020 06:17 PM	JHC RCRA GW Monitoring - N&E/AMP/GSI Wells
20-0405-14	TW-19-04A Field MSD	Groundwater	04/14/2020 06:17 PM	JHC RCRA GW Monitoring - N&E/AMP/GSI Wells

Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **JHC RCRA GW Monitoring - N&E/AMP/GSI Wells (395496)**
 Field Sample ID: **MW-14S**
 Lab Sample ID: 20-0405-01
 Matrix: Groundwater

Laboratory Project: **20-0405**
 Collect Date: 04/16/2020
 Collect Time: 03:36 PM

Mercury by EPA 7470A, Total, Aqueous

Aliquot: 20-0405-01-C02-A01

Analyst: TMR

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Mercury	ND		ug/L	0.2	04/21/2020	AB20-0421-02

Metals by EPA 6020; HMP/AMP Detection & Assessment Monitoring

Aliquot: 20-0405-01-C02-A02

Analyst: SLK

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Antimony	ND		ug/L	1	04/24/2020	AB20-0424-04
Arsenic	ND		ug/L	1	04/24/2020	AB20-0424-04
Barium	8		ug/L	5	04/24/2020	AB20-0424-04
Chromium	ND		ug/L	1	04/24/2020	AB20-0424-04
Lithium	ND		ug/L	10	04/24/2020	AB20-0424-04
Molybdenum	ND		ug/L	5	04/24/2020	AB20-0424-04
Selenium	ND		ug/L	1	04/24/2020	AB20-0424-04

Anions by EPA 300.0 CCR Rule Analyte List, Cl, F, SO4, Aqueous

Aliquot: 20-0405-01-C03-A01

Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Chloride	ND		ug/L	1000	04/23/2020	AB20-0423-01
Fluoride	ND		ug/L	1000	04/23/2020	AB20-0423-01
Sulfate	2290		ug/L	2000	04/23/2020	AB20-0423-01

Total Dissolved Solids by SM 2540C

Aliquot: 20-0405-01-C04-A01

Analyst: DLR

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Total Dissolved Solids	29		mg/L	10	04/21/2020	AB20-0421-09

Groundwater Metals by EPA 6020A, Dissolved, JHC List

Aliquot: 20-0405-01-C07-A01

Analyst: SLK

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Antimony	ND		ug/L	1	04/21/2020	AB20-0420-12
Arsenic	ND		ug/L	1	04/21/2020	AB20-0420-12
Chromium	ND		ug/L	1	04/21/2020	AB20-0420-12
Lithium	ND		ug/L	10	04/20/2020	AB20-0420-12
Molybdenum	ND		ug/L	5	04/21/2020	AB20-0420-12
Nickel	ND		ug/L	2	04/21/2020	AB20-0420-12
Selenium	ND		ug/L	1	04/21/2020	AB20-0420-12
Vanadium	ND		ug/L	2	04/21/2020	AB20-0420-12
Boron	ND		ug/L	20	04/20/2020	AB20-0420-12

Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **JHC RCRA GW Monitoring - N&E/AMP/GSI Wells (395496)**
 Field Sample ID: **PZ-24S**
 Lab Sample ID: 20-0405-02
 Matrix: Groundwater

Laboratory Project: **20-0405**
 Collect Date: 04/16/2020
 Collect Time: 02:33 PM

Mercury by EPA 7470A, Total, Aqueous

Aliquot: 20-0405-02-C02-A01

Analyst: TMR

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Mercury	ND		ug/L	0.2	04/21/2020	AB20-0421-02

Metals by EPA 6020; HMP/AMP Detection & Assessment Monitoring

Aliquot: 20-0405-02-C02-A02

Analyst: SLK

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Antimony	ND		ug/L	1	04/24/2020	AB20-0424-04
Arsenic	ND		ug/L	1	04/24/2020	AB20-0424-04
Barium	24		ug/L	5	04/24/2020	AB20-0424-04
Chromium	2		ug/L	1	04/24/2020	AB20-0424-04
Lithium	ND		ug/L	10	04/24/2020	AB20-0424-04
Molybdenum	ND		ug/L	5	04/24/2020	AB20-0424-04
Selenium	ND		ug/L	1	04/24/2020	AB20-0424-04

Anions by EPA 300.0 CCR Rule Analyte List, Cl, F, SO4, Aqueous

Aliquot: 20-0405-02-C03-A01

Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Chloride	ND		ug/L	1000	04/23/2020	AB20-0423-01
Fluoride	ND		ug/L	1000	04/23/2020	AB20-0423-01
Sulfate	2730		ug/L	2000	04/23/2020	AB20-0423-01

Total Dissolved Solids by SM 2540C

Aliquot: 20-0405-02-C04-A01

Analyst: DLR

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Total Dissolved Solids	28		mg/L	10	04/21/2020	AB20-0421-09

Groundwater Metals by EPA 6020A, Dissolved, JHC List

Aliquot: 20-0405-02-C07-A01

Analyst: SLK

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Antimony	ND		ug/L	1	04/21/2020	AB20-0420-12
Arsenic	ND		ug/L	1	04/21/2020	AB20-0420-12
Chromium	ND		ug/L	1	04/21/2020	AB20-0420-12
Lithium	ND		ug/L	10	04/20/2020	AB20-0420-12
Molybdenum	ND		ug/L	5	04/21/2020	AB20-0420-12
Nickel	ND		ug/L	2	04/21/2020	AB20-0420-12
Selenium	ND		ug/L	1	04/21/2020	AB20-0420-12
Vanadium	2		ug/L	2	04/21/2020	AB20-0420-12
Boron	ND		ug/L	20	04/20/2020	AB20-0420-12

Laboratory Services
A CENTURY OF EXCELLENCE

Sample Site: **JHC RCRA GW Monitoring - N&E/AMP/GSI Wells (395496)**
 Field Sample ID: **PZ-40S**
 Lab Sample ID: 20-0405-03
 Matrix: Groundwater

Laboratory Project: **20-0405**
 Collect Date: 04/16/2020
 Collect Time: 11:02 AM

Mercury by EPA 7470A, Total, Aqueous

Aliquot: 20-0405-03-C02-A01

Analyst: TMR

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Mercury	ND		ug/L	0.2	04/21/2020	AB20-0421-02

Metals by EPA 6020; HMP/AMP Detection & Assessment Monitoring

Aliquot: 20-0405-03-C02-A02

Analyst: SLK

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Antimony	ND		ug/L	1	04/24/2020	AB20-0424-04
Arsenic	ND		ug/L	1	04/24/2020	AB20-0424-04
Barium	22		ug/L	5	04/24/2020	AB20-0424-04
Chromium	1		ug/L	1	04/24/2020	AB20-0424-04
Lithium	ND		ug/L	10	04/24/2020	AB20-0424-04
Molybdenum	ND		ug/L	5	04/24/2020	AB20-0424-04
Selenium	ND		ug/L	1	04/24/2020	AB20-0424-04

Anions by EPA 300.0 CCR Rule Analyte List, Cl, F, SO4, Aqueous

Aliquot: 20-0405-03-C03-A01

Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Chloride	ND		ug/L	1000	04/23/2020	AB20-0423-01
Fluoride	ND		ug/L	1000	04/23/2020	AB20-0423-01
Sulfate	2720		ug/L	2000	04/23/2020	AB20-0423-01

Total Dissolved Solids by SM 2540C

Aliquot: 20-0405-03-C04-A01

Analyst: DLR

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Total Dissolved Solids	33		mg/L	10	04/21/2020	AB20-0421-09

Groundwater Metals by EPA 6020A, Dissolved, JHC List

Aliquot: 20-0405-03-C07-A01

Analyst: SLK

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Antimony	ND		ug/L	1	04/21/2020	AB20-0420-12
Arsenic	ND		ug/L	1	04/21/2020	AB20-0420-12
Chromium	ND		ug/L	1	04/21/2020	AB20-0420-12
Lithium	ND		ug/L	10	04/20/2020	AB20-0420-12
Molybdenum	ND		ug/L	5	04/21/2020	AB20-0420-12
Nickel	ND		ug/L	2	04/21/2020	AB20-0420-12
Selenium	ND		ug/L	1	04/21/2020	AB20-0420-12
Vanadium	ND		ug/L	2	04/21/2020	AB20-0420-12
Boron	ND		ug/L	20	04/20/2020	AB20-0420-12



Laboratory Services
A CENTURY OF EXCELLENCE

Analytical Report

Report Date: 07/28/20

Data Qualifiers	Exception Summary
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No exceptions occurred.

TITLE: SAMPLE LOG-IN – SHIPMENT INSPECTION FORM

Project Log-In Number: 20-0405

Inspection Date: 04-17-2020 Inspection By: BLE

Sample Origin/Project Name: JH CAMPBELL HMP ICR

Shipment Delivered By: Enter the type of shipment carrier.

Pony _____ FedEx _____ UPS _____ USPS _____ Airborne _____

Other/Hand Carry (whom) CET CRH DMW

Tracking Number: _____ Shipping Form Attached: Yes _____ No _____

Shipping Containers: Enter the type and number of shipping containers received.

Cooler Cardboard Box _____ Custom Case _____ Envelope/Mailer _____

Loose/Unpackaged Containers _____ Other _____

Condition of Shipment: Enter the as-received condition of the shipment container.

Damaged Shipment Observed: None Dented _____ Leaking _____

Other _____

Shipment Security: Enter if any of the shipping containers were opened before receipt.

Shipping Containers Received: Opened _____ Sealed

Enclosed Documents: Enter the type of documents enclosed with the shipment.

CoC Work Request _____ Air Data Sheet _____ Other _____

Temperature of Containers: Measure the temperature of several sample containers.

As-Received Temperature 5.0 - 8.3° Samples Received on Ice: Yes _____ No

Number and Type of Containers: Enter the total number of sample containers received.

Container Type	Water	Soil	Other	Broken	Leaking
VOA (40mL or 60mL)	_____	_____	_____	_____	_____
Quart/Liter (g/p)	_____	_____	_____	_____	_____
9-oz (amber glass jar)	_____	_____	_____	_____	_____
2-oz (amber glass)	_____	_____	_____	_____	_____
125 mL (plastic)	<u>28</u>	_____	_____	_____	_____
24 mL vial (glass)	<u>12</u>	_____	_____	_____	_____
<u>25</u> 500 mL (plastic)	_____	_____	_____	_____	_____
Other	_____	_____	_____	_____	_____

041720
1020

pH verified < 2 on 04-17-2020 by BLE

CHAIN OF CUSTODY

CONSUMERS ENERGY COMPANY – LABORATORY SERVICES



135 WEST TRAIL ST., JACKSON, MI 49201 • (517) 788-1251 • FAX (517) 788-2533

SAMPLING SITE JHC 2 nd Qtr. 2020 RCRA GW Monitoring N&E / AMP / GSI Wells				PROJECT NUMBER 20-0405			ANALYSIS REQUESTED					PAGE <u>1</u> OF <u>1</u>		
SAMPLING TEAM CET / CLH / DMW				DATE SHIPPED		SITE SKETCHED ATTACHED? CIRCLE ONE NO		Metals, Total	Anions	TDS	Radium	SEND REPORT TO <u>Kevin Starken</u>		
						Beth Swanberg, TRC								
												PHONE _____		
CE CONTROL #	SAMPLE DATE	SAMPLE TIME	SAMPLE MATRIX	SAMPLE DESCRIPTION / LOCATION	DEPTH	# OF CONTAINERS								REMARKS
20-0405-01	4/16/20	1536	GW	MW-14S	--	5	X	X	X	X				
-02	↓	1433	GW	PZ-24S	--	5	X	X	X	X				
-03	↓	1102	GW	PZ-40S	--	5	X	X	X	X				
-04	4/14/20	1817	GW	TW-19-04A	--	5	X	X	X	X				
-05	4/10/20	1551	GW	TW-19-05	--	5	X	X	X	X				
-06	↓	1666	GW	TW-19-06A	--	5	X	X	X	X				
-07	↓	1652	GW	PZ-23S	--	5	X	X	X	X				
-08	↓	1255	GW	PZ-24	--	5	X	X	X	X				
-09	↓	0938	GW	PZ-40	--	5	X	X	X	X				
-10	↓	1102	GW	DUP-05	--	5	X	X	X	X				
-11	↓	1825	AQ	EB-05	--	5	X	X	X	X				
-12	↓	1100	AQ	FB-05	--	5	X	X	X	X				
RELINQUISHED BY (SIGNATURE) <i>Dawn Wilber</i>				DATE/TIME 4.17.20 0915		RECEIVED BY (SIGNATURE) <i>[Signature]</i>				COMMENTS Total Metals = HMP-AMP List Metals and Mercury (01-06) Total Metals = Appendix III-IV List Metals and Mercury (07-09) 5.0 - 8.3 °C				
RELINQUISHED BY (SIGNATURE)				DATE/TIME		RECEIVED BY (SIGNATURE)								

ORIGINAL TO LAB COPY TO CUSTOMER

Appendix E

April 2020 Field Notes

Consumers Energy Company
Monitoring Well Sampling Worksheet

Well ID JHC-MW-15000 Date 4.14.2020 Control Number 20-0388-01
 Location JHC Pond A Well Material: PVC SS Iron Galv. Steel

Purge Method: Peristaltic Submersible 1/2" Fultz Bailor

Depth to Water Tape: _____ S/N: _____

QC SAMPLE: MS/MSD DUP- Sonde ID: 08C 11M 15H 19M

Depth-to-water T/PVC (ft) 33.31 Depth-To-Bottom T/PVC (ft) 39.40 Completed by CUH

Time	pH	Temp	Sp Cond	DO	DO	ORP	Pump Rate	Water level	Turbidity
min	units	°C	uS/cm	% sat.	ppm	mV	mL/min	Drawdown ft	NTU
3-5 min	+/- 0.1	NA	+/- 3%	+/- 10%	+/- 0.3ppm	+/- 10mV	*	< 0.33	+/- 10%

Stabilization parameters for the last three readings

1426							300	33.65	
1436	7.33	13.7	814	2.8	0.28	-32.4	300	33.65	4.64
1439	7.28	14.2	814	2.7	0.27	-32.1	300	33.65	3.63
1442	7.26	14.1	813	2.6	0.27	-31.4	300	33.65	2.18
1445	7.25	13.8	810	2.8	0.29	-22.0	300	33.65	1.54
1448	7.24	13.8	806	3.0	0.31	-20.0	300	33.65	1.13
1451	7.22	13.7	805	3.7	0.38	-17.3	300	33.65	1.06
1454	7.22	13.8	807	3.4	0.34	-12.7	300	33.65	0.18
1457	7.22	13.6	808	3.5	0.35	-12.3	300	33.65	0.11
1500	7.22	13.7	807	3.5	0.36	-11.6	300	33.65	0.00
1501	collected sample								

Total Pump Time (min): 34 Total Purge Volume (gal): ~5 Reviewed by: EB 04/27/20

Weather: 36°F, sunny/cloudy, very windy, started to snow ~1455

Comments:

Bottles Filled		Preservative Codes: A - NONE B - HNO3 C - H2SO4 D - NaOH E - HCl F -			Bottles Filled		Preservative Codes: A - NONE B - HNO3 C - H2SO4 D - NaOH E - HCl F -		
Quantity	Size	Type	Preservative Code	Filtered Y/N	Quantity	Size	Type	Preservative Code	Filtered Y/N
1	125 mL	HIDE	B	N					
1	125 mL	↓	A	↓					
1	250 mL	↓	A	↓					
2	1L	↓	B	↓					

* Pump rate should be <500 mL/min for low-flow and <1 gal/min for high Volume.

Consumers Energy Company
 Monitoring Well Sampling Worksheet

4 (4)

Well ID JHC-MW-15007 Date 4-14-2020 Control Number 20-0387-02-10-11
 Location JHC POND A Well Material: PVC SS Iron Galv. Steel
 Purge Method: Peristaltic Submersible 3/8" Fultz Bailer
 Depth to Water Tap: GPOTECH S/N: 1003

QC SAMPLE: MS/MSD DUP- Sonde ID: 08C 11M 15H 19M

Depth-to-water T/PVC (ft) 33.92 Depth-To-Bottom T/PVC (ft) 35.19 Completed by WJH

Time	pH	Temp	Sp Cond	DO	DO	ORP	Pump Rate	Water level	Turbidity
min	units	°C	uS/cm	% sat.	ppm	mV	mL/min	Drawdown ft	NTU
3-5 min	+/- 0.1	NA	+/- 3%	+/- 10%	+/- 0.3ppm	+/- 10mV	*	< 0.33	+/- 10%

Stabilization parameters for the last three readings

1143							280		
1153	7.03	13.2	578	38.4	3.99	+45.8	280	-	2.06
1156	7.04	13.2	569	38.2	3.95	+45.2	280	-	0.54
1159	7.04	13.2	541	37.8	3.90	+45.7	280	-	0.06
1202	7.05	13.3	555	37.6	3.88	+62.8	280	-	0.00
1205	7.04	13.3	549	37.3	3.85	+48.4	280	-	0.00
1208	7.04	13.2	546	37.1	3.83	+69.1	280	-	0.00
1211	7.04	13.3	545	37.1	3.82	+69.7	280	-	0.00
1212	collected samples								

Total Pump Time (min): 32 Total Purge Volume (gal): ~ 2.8 Reviewed by: EB

Weather: 35°F, sunny, very windy 04-27-20

Comments: collected FMS/MSD / water below pump - can't measure while purging

Bottles Filled		Preservative Codes: A - NONE B - HNO3 C - H2SO4 D - NaOH E - HCl F -							
Quantity	Size	Type	Preservative Code	Filtered Y/N	Quantity	Size	Type	Preservative Code	Filtered Y/N
3	HDPE	125ML	B	N					
3	HDPE	125ML	A						
3	HDPE	250ML	A						
1	HDPE	1L	B						

* Pump rate should be <500 mL/min for low-flow and <1 gal/min for high Volume.

Consumers Energy Company
Monitoring Well Sampling Worksheet

4

Well ID JHC-MW-1500BR Date 4.14.2020 Control Number 20-0363-03
 Location JHC POND A Well Material: PVC SS Iron Galv. Steel
 Purge Method: Peristaltic Submersible 3/8" Fultz Bailor
 Depth to Water Tape: Geotech S/N: 1003

QC SAMPLE: MS/MSD DUP- Sonde ID: 08C 11M 15H 19M

Depth-to-water T/PVC (ft) 41.43 Depth-To-Bottom T/PVC (ft) 48.07 Completed by UHT

Time	pH	Temp	Sp Cond	DO	DO	ORP	Pump Rate	Water level	Turbidity
min	units	°C	uS/cm	% sat.	ppm	mV	mL/min	Drawdown ft	NTU
3-5 min	+/- 0.1	NA	+/- 3%	+/- 10%	+/- 0.3ppm	+/- 10mV	*	< 0.33	+/- 10%

Stabilization parameters for the last three readings

1101							384	41.49	
1110	6.97	13.4	857	9.0	0.91	+73.8	384	41.49	27.95
1113	6.96	13.8	832	13.1	1.33	+55.4	384	41.49	9.59
1116	6.96	13.8	829	13.8	1.41	+54.7	384	41.49	7.79
1119	6.93	13.8	827	13.9	1.42	+55.8	384	41.49	2.33
1122	6.93	13.8	826	13.7	1.40	+55.8	384	41.49	1.90
1125	6.93	13.8	824	13.7	1.41	+56.0	384	41.49	1.31
1126	collected sample								

Total Pump Time (min): 25 Total Purge Volume (gal): 25 gal Reviewed by: EB
 Weather: ~35°F, sunny, very windy 04-27-20

Comments:

Bottles Filled		Preservative Codes: A - NONE B - HNO3 C - H2SO4 D - NaOH E - HCl F - _____							
Quantity	Size	Type	Preservative Code	Filtered Y/N	Quantity	Size	Type	Preservative Code	Filtered Y/N
1	125ml	HDPE	A	Z					
1	125ml	↓	B	Z					
1	250ml	↓	A	Z					
2	500/1000ml	↓	B	Z					

* Pump rate should be < 500 mL/min for low-flow and < 1 gal/min for high Volume.

Consumers Energy Company
 Monitoring Well Sampling Worksheet

4

Well ID JHC-MW-15009 Date 4.14.2020 Control Number 20-0388B-04
 Location JHC Pond A Well Material: PVC SS Iron Galv. Steel
 Purge Method: Peristaltic Submersible 3 1/2" Fultz Bailor
 Depth to Water Tape: GeoTech S/N: 1003

QC SAMPLE: MS/MSD DUP- 02 Sonde ID: 08C 11M 15H 19M

Depth-to-water T/PVC (ft) 41.68 Depth-To-Bottom T/PVC (ft) 42.43 Completed by UW1

Time	pH	Temp	Sp Cond	DO	DO	ORP	Pump Rate	Water level	Turbidity
min	units	°C	uS/cm	% sat.	ppm	mV	mL/min	Drawdown ft	NTU
3-5 min	+/- 0.1	NA	+/- 3%	+/- 10%	+/- 0.3ppm	+/- 10mV	*	< 0.33	+/- 10%

Stabilization parameters for the last three readings

1010							200			
1020	7.14	13.7	593	39.0	3.97	+69.8	200	-	4.60	
1023	7.13	13.8	591	37.8	3.85	+67.1	200	-	2.22	
1026	7.15	14.0	590	36.7	3.72	+64.8	200	-	0.71	
1029	7.14	14.2	589	36.0	3.63	+65.7	200	-	0.42	
1032	7.15	14.3	588	35.8	3.61	+65.6	200	-	0.40	
1035	7.15	14.3	587	34.9	3.52	+66.4	200	-	0.25	
1036	Collected Samples								41.71	

Total Pump Time (min): 26 Total Purge Volume (gal): ~2.0 Reviewed by: EB

Weather: 33°F, Sunny, very windy 04-27-20

Comments: collected Field dup / water level below pump; can't measure while

Bottles Filled		Preservative Codes: A - NONE B - HNO3 C - H2SO4 D - NaOH E - HCl F -			Purging				
Quantity	Size	Type	Preservative Code	Filtered Y/N	Quantity	Size	Type	Preservative Code	Filtered Y/N
1	125ml	HDPE	B	N	1	125ml	HDPE	B	
1	125ml	HDPE	A	N	1	125ml	HDPE	A	
1	250ml	HDPE	A	N	1	250ml	HDPE	A	
2	1L	HDPE	B	N	2	1L	HDPE	B	

* Pump rate should be <500 mL/min for low-flow and <1 gal/min for high Volume.

Consumers Energy Company
Monitoring Well Sampling Worksheet

4

Well ID JHC-MW-15010 Date 4-14-2020 Control Number 20-0387-05
 Location JHC Pond A Well Material: PVC SS Iron Galv. Steel
 Purge Method: Peristaltic Submersible 3/8" Fultz Bailer
 Depth to Water Tape: Geotech S/N: 1003

QC SAMPLE: MS/MSD DUP- Sonde ID: 08C 11M 15H 19M

Depth-to-water T/PVC (ft) 41.32 Depth-To-Bottom T/PVC (ft) 43.37 Completed by UH

Time	pH	Temp	Sp Cond	DO	DO	ORP	Pump Rate	Water level	Turbidity
min	units	°C	uS/cm	% sat.	ppm	mV	mL/min	Drawdown ft	NTU
3-5 min	+/- 0.1	NA	+/- 3%	+/- 10%	+/- 0.3ppm	+/- 10mV	*	< 0.33	+/- 10%

Stabilization parameters for the last three readings

0920									
0926	6.63	12.4	558	27.5	2.87	+154.3	380	^{at 0942} 41.30	0.52
0929	6.63	13.0	557	27.8	2.88	+146.0	380	41.30	0.05
0932	6.63	13.0	556	27.5	2.85	+142.6	380	41.30	0.00
0935	6.63	13.1	553	27.5	2.89	+136.1	380	41.30	0.03
0938	6.63	13.1	556	27.0	2.79	+132.9	380	41.30	0.20
0941	6.63	13.1	555	27.0	2.78	+132.1	380	41.30	0.00
0942	collected sample								

Total Pump Time (min): 22 Total Purge Volume (gal): 3.5 Reviewed by: EB

Weather: 83°C, very windy, sunny/cloudy 04-27-20

Comments: (EB) @ 0946

Bottles Filled		Preservative Codes: A - NONE B - HNO3 C - H2SO4 D - NaOH E - HCl F -							
Quantity	Size	Type	Preservative Code	Filtered Y/N	Quantity	Size	Type	Preservative Code	Filtered Y/N
1	125mL	HDPE	B	N					
1	125mL	↓	A	N					
1	250mL	↓	A	N					
2	1L	↓	B	N					

* Pump rate should be <500 mL/min for low-flow and <1 gal/min for high Volume.

Consumers Energy Company
Monitoring Well Sampling Worksheet

Well ID JHC-MW-15011 Date 4.15.2020 Control Number 20-0324-04
 Location JHC Pond A Well Material: PVC SS Iron Galv. Steel
 Purge Method: Peristaltic Submersible 3/8" Fultz Bailor
 Depth to Water Tape: GeoTech S/N: 1003

QC SAMPLE: MS/MSD DUP- Sonde ID: 08C 11M 15H 19M

Depth-to-water T/PVC (ft) 37.83 Depth-To-Bottom T/PVC (ft) 40.53 Completed by CUH

Time	pH	Temp	Sp Cond	DO	DO I	ORP	Pump Rate	Water level	Turbidity
min	units	°C	uS/cm	% sat.	ppm	mV	mL/min	Drawdown ft	NTU
3-5 min	+/- 0.1	NA	+/- 3%	+/- 10%	+/- 0.3ppm	+/- 10mV	*	< 0.33	+/- 10%

Stabilization parameters for the last three readings

0910							300	37.85	
0920	7.65	13.8	801	3.9	0.39	-123.1	300	37.85	0.79
0923	7.63	13.9	802	3.5	0.35	-121.7	300	37.85	0.55
0926	7.63	14.0	802	3.4	0.34	-122.2	300	37.85	0.46
0929	7.63	14.0	803	3.3	0.34	-122.4	300	37.85	0.43
0932	7.63	14.0	803	3.3	0.33	-122.8	300	37.85	0.46
0935	7.63	14.0	803	3.2	0.32	-122.9	300	37.85	0.45
0936	collected sample								

Total Pump Time (min): 26 Total Purge Volume (gal): 1.5 Reviewed by: EB

Weather: 29°F, cloudy, snow 04-27-20

Comments:

Bottles Filled		Preservative Codes: A - NONE B - HNO3 C - H2SO4 D - NaOH E - HCl F - Zinc Acetate / NaOH							
Quantity	Size	Type	Preservative Code	Filtered Y/N	Quantity	Size	Type	Preservative Code	Filtered Y/N
1	125mL	HDPE	B	N	2	1L	HDPE	B	N
1	125mL	HDPE	A	N	2	60mL	VOA	A	N
1+1=2	250mL	HDPE	A	N	1	125mL	HDPE	F	N
1	125mL	HDPE	C	N					

* Pump rate should be <500 mL/min for low-flow and <1 gal/min for high Volume.

Consumers Energy Company
 Monitoring Well Sampling Worksheet

Well ID JHC MW-15024 Date 4.16.20 Control Number 20-0395-01
 Location JH Campbell Well Material: PVC SS Iron Galv. Steel
 Purge Method: Peristaltic Submersible Fultz Bailor
 Depth to Water Tape: Solinst S/N: 312386

QC SAMPLE: MS/MSD DUP- Sonde ID: 08C 11M 15H 19M

Depth-to-water T/PVC (ft) 16.05 Depth-To-Bottom T/PVC (ft) _____ Completed by dmw

Time	pH	Temp	Sp Cond	DO	DO	ORP	Pump Rate	Water level	Turbidity
min	units	°C	uS/cm	% sat.	ppm	mV	mL/min	Drawdown ft	NTU
3-5 min	+/- 0.1	NA	+/- 3%	+/- 10%	+/- 0.3ppm	+/- 10mV	*	< 0.33	+/- 10%

Stabilization parameters for the last three readings

1008								10.06	
1013	6.31	7.56	378	34.5	4.08	+207.4	200	10.06	9.5
1018	6.43	7.40	346	11.4	1.36	+221.7	200	10.06	8.8
1023	6.36	7.48	336	9.8	1.17	+220.1	200	10.06	8.1
1028	6.40	7.41	325	7.9	0.94	+213.5	200	10.06	0.0
1033	6.46	7.53	322	7.2	0.90	+209.5	200	10.06	0.0
1038	6.52	7.58	320	7.1	0.88	+205.4	200	10.06	0.0
1043	6.54	7.52	321	7.0	0.87	+203.3	200	10.06	0.0
1044									
1058									

Total Pump Time (min): 36 Total Purge Volume (gal): 1.9 Reviewed by: EB

Weather: Sunny; 35°F 04-27-20

Comments:

Bottles Filled		Preservative Codes: A - NONE B - HNO3 C - H2SO4 D - NaOH E - HCl F - NaOH Zn Ac etate							
Quantity	Size	Type	Preservative Code	Filtered Y/N	Quantity	Size	Type	Preservative Code	Filtered Y/N
1	125 ml	HDRC	B	N	2	60 ml	VOA	A	N
1	↓	↓	A	N	1	125 ml	HDRC	F	N
1	250 ml	↓	A	N	1	↓	↓	AC	N
2	2L	↓	B	N	+ dmw 4/16/20			dmw 4.16.20	

* Pump rate should be <500 mL/min for low-flow and <1 gal/min for high Volume.

Consumers Energy Company
 Monitoring Well Sampling Worksheet

Well ID JHC MW-15025 Date 4.16.20 Control Number 20-0395-02
 Location JH Campbell Well Material: PVC SS Iron Galv. Steel
 Purge Method: Peristaltic Submersible Fultz Bailor
 Depth to Water Tape: Solinist S/N: 312306

QC SAMPLE: MS/MSD DUP- Sonde ID: 08C 11M 15H 19M

Depth-to-water T/PVC (ft) 9.04 Depth-To-Bottom T/PVC (ft) _____ Completed by dmw

Time	pH	Temp	Sp Cond	DO	DO	ORP	Pump Rate	Water level	Turbidity
min	units	°C	uS/cm	% sat.	ppm	mV	mL/min	Drawdown ft	NTU
3-5 min	+/- 0.1	NA	+/- 3%	+/- 10%	+/- 0.3ppm	+/- 10mV	*	< 0.33	+/- 10%

Stabilization parameters for the last three readings

1107								9.06	
1112	7.24	7.04	334	35.6	4.30	+193.8	200	9.06	0.0
1117	7.03	6.78	332	18.3	2.22	+208.2	200	9.06	0.0
1122	7.00	6.65	326	14.5	1.77	+209.5	200	9.06	0.0
1127	6.68	6.71	299	17.3	2.12	+202.8	200	9.06	0.0
1132	6.43	6.71	264	26.7	3.26	+200.2	200	9.06	0.0
1137	6.28	6.78	241	32.0	3.90	+198.2	200	9.06	0.0
1142	6.24	6.99	227	33.9	4.11	+196.1	200	9.06	0.0
1147	6.24	7.13	221	34.5	4.17	+194.0	200	9.06	0.0
1152	6.23	7.14	218	34.6	4.18	+193.7	200	9.06	0.0
1157	6.23	7.18	215	34.7	4.19	+193.8	200	9.06	0.0
1158									
1214									

Total Pump Time (min): 51 Total Purge Volume (gal): 2.7 Reviewed by: EB

Weather: Sunny; 34°F 04-17-20

Comments:

Bottles Filled		Preservative Codes: A - NONE B - HNO3 C - H2SO4 D - NaOH E - HCl F -			Bottles Filled		Preservative Codes: A - NONE B - HNO3 C - H2SO4 D - NaOH E - HCl F -		
Quantity	Size	Type	Preservative Code	Filtered Y/N	Quantity	Size	Type	Preservative Code	Filtered Y/N
2	125ml	HDPE	B	N	2	60ml	VVA	A	
2	↓	↓	A	N	1	125ml	HDPE	C	
1	250ml	↓	A	N	1	↓	↓	F	
2	1L	↓	B	N					

* Pump rate should be <500 mL/min for low-flow and <1 gal/min for high Volume.

Consumers Energy Company
 Monitoring Well Sampling Worksheet

Well ID JHC-MW-15027 Date 4.16.2020 Control Number 20-0395-03
 Location JHC Background Well Material: PVC SS Iron Galv. Steel
 Purge Method: Peristaltic Submersible Fultz Bailor
 Depth to Water Tape: Geotech S/N: 1003

QC SAMPLE: MS/MSD DUP- Sonde ID: 08C 11M 15H 19M

Depth-to-water T/PVC (ft) 10.99 Depth-To-Bottom T/PVC (ft) 22.91 Completed by CUH

Time	pH	Temp	Sp Cond	DO	DO	ORP	Pump Rate	Water level	Turbidity
min	units	°C	uS/cm	% sat.	ppm	mV	mL/min	Drawdown ft	NTU
3-5 min	+/- 0.1	NA	+/- 3%	+/- 10%	+/- 0.3ppm	+/- 10mV	*	< 0.33	+/- 10%

Stabilization parameters for the last three readings

1333							160	10.99	
1343	4.87	7.8	31.5	56.4	6.64	+139.7	160	10.99	11.80
1346	4.90	7.7	32.0	55.8	6.60	+140.1	160	10.99	11.64
1349	4.96	7.7	32.8	54.2	6.41	+143.6	160	10.99	9.63
1352	4.98	7.8	33.5	53.3	6.28	+148.4	160	10.99	8.10
1355	5.03	7.7	35.0	51.7	6.12	+150.7	100	10.99	7.44
1358	5.10	7.4	37.5	50.5	5.98	+151.0	160	10.99	6.61
1401	5.20	7.7	40.4	48.4	5.75	+151.4	160	10.99	6.00
1404	5.25	7.8	42.5	47.4	5.59	+151.6	160	10.99	5.74
1407	5.30	7.7	44.3	46.7	5.52	+151.1	160	10.99	5.21
1410	5.34	7.7	48.8	44.7	5.28	+152.2	160 ³⁰⁰	10.99	3.50
1413	5.37	7.7	49.2	43.9	5.18	+151.9	160 ³⁰⁰	10.99	3.37
1416	5.44	7.8	52.9	41.6	4.91	+150.7	300	10.99	2.92
1419	5.47	7.7	53.2	40.2	4.76	+150.3	300	10.99	2.94
1422	5.50	7.7	56.7	37.4	4.43	+148.5	300	10.99	2.76

Total Pump Time (min): _____ Total Purge Volume (gal): _____ Reviewed by: EB

Weather: 32°F, windy, cold, sunny 04-27-20

Comments: increased pump speed to stabilize pH

Bottles Filled		Preservative Codes: A - NONE B - HNO3 C - H2SO4 D - NaOH E - HCl F - Zinc Acetate / NaOH							
Quantity	Size	Type	Preservative Code	Filtered Y/N	Quantity	Size	Type	Preservative Code	Filtered Y/N
1	125mL	HDPE	B	N	1	250mL	HDPE	A	N
1+1=2	↓	↓	A	N	2	60mL	NaOH	A	N
1	↓	↓	C	N	2	1L	HDPE	B	N
1	↓	↓	F	N					

* Pump rate should be <500 mL/min for low-flow and <1 gal/min for high Volume.

Consumers Energy Company
 Monitoring Well Sampling Worksheet

Well ID JHC-MW-15027 Date 4.16.2020 Control Number 20-0395-03
 Location JHC Background Well Material: PVC SS Iron Galv. Steel
 Purge Method: Peristaltic Submersible Fultz Bailor
 Depth to Water Tape: _____ S/N: _____

QC SAMPLE: MS/MSD DUP- Sonde ID: 08C 11M 15H 19M

Depth-to-water T/PVC (ft) 10.99 Depth-To-Bottom T/PVC (ft) 22.91 Completed by LVH

Time	pH	Temp	Sp Cond	DO	DO	ORP	Pump Rate	Water level	Turbidity
min	units	°C	uS/cm	% sat.	ppm	mV	mL/min	Drawdown ft	NTU
3-5 min	+/- 0.1	NA	+/- 3%	+/- 10%	+/- 0.3ppm	+/- 10mV	*	<0.33	+/- 10%

Stabilization parameters for the last three readings

1425	5.54	7.8	56.4	37.9	4.48	+148.5	300	10.99	2.50
1428	5.42	7.7	41.4	34.2	4.28	+147.2	300	10.99	2.52
1431	5.44	7.7	59.7	35.7	4.22	+147.2	300	10.99	2.73
1434	5.43	7.7	59.2	34.9	4.13	+147.2	300	10.99	2.78

collected samples @ 1435 after 1 hr pumping time.

Total Pump Time (min): _____ Total Purge Volume (gal): _____ Reviewed by: EB

Weather: _____ 04-27-20

Comments: See PG. 1 & 2

Bottles Filled		Preservative Codes: A - NONE B - HNO3 C - H2SO4 D - NaOH E - HCl F - _____							
Quantity	Size	Type	Preservative Code	Filtered Y/N	Quantity	Size	Type	Preservative Code	Filtered Y/N

* Pump rate should be <500 mL/min for low-flow and <1 gal/min for high Volume.

Consumers Energy Company
Monitoring Well Sampling Worksheet

Well ID JHC MW-15023 Date 4.16-20 Control Number 20-0395-04
 Location JH Campbell Well Material: PVC SS Iron Galv. Steel
 Purge Method: Peristaltic Submersible Fultz Bailor
 Depth to Water Tape: Solinst S/N: 312386

QC SAMPLE: MS/MSD DUP-03 Sonde ID: 08C 11M 15H 19M

Depth-to-water T/PVC (ft) 15.11 Depth-To-Bottom T/PVC (ft) 27.85 Completed by dmw

Time	pH	Temp	Sp Cond	DO	DO	ORP	Pump Rate	Water level	Turbidity
min	units	°C	uS/cm	% sat.	ppm	mV	mL/min	Drawdown ft	NTU
3-5 min	+/- 0.1	NA	+/- 3%	+/- 10%	+/- 0.3ppm	+/- 10mV	*	< 0.33	+/- 10%

Stabilization parameters for the last three readings

0853								15.11	
0858	6.20	7.63	78	30.0	3.56	+203.3	200	15.11	0.0
0903	5.27	8.06	83	12.6	1.41	+218.1	200	15.11	0.0
0908	5.28	8.10	84	10.1	1.20	+209.0	200	15.11	0.0
0913	5.33	7.93	84	8.9	1.05	+206.1	200	15.11	0.0
0918	5.33	8.09	82	7.4	0.87	+208.4	200	15.11	0.0
0928	5.34	8.06	83	7.6	0.83	+208.1	200	15.11	0.0
0928	5.38	8.19	84	6.8	0.81	+208.9	200	15.11	0.0
0929									
0952									

Total Pump Time (min): 36 Total Purge Volume (gal): 1.9 Reviewed by: EB

Weather: Sunny; 34°F 04-27-20

Comments:

Bottles Filled		Preservative Codes: A - NONE B - HNO3 C - H2SO4 D - NaOH E - HCl F -							
Quantity	Size	Type	Preservative Code	Filtered Y/N	Quantity	Size	Type	Preservative Code	Filtered Y/N
2	250 ml	HDPE	A	N					
2	125 ml	↓	A	N					
2	↓	↓	B	N					
2	1L	↓	B	N					

* Pump rate should be <500 mL/min for low-flow and <1 gal/min for high Volume.

Consumers Energy Company
Monitoring Well Sampling Worksheet

Well ID JHC MW-15026 Date 4.16.20 Control Number 20-0395-05
 Location JH Campbell Well Material: PVC SS Iron Galv. Steel
 Purge Method: Peristaltic Submersible Fultz Bailor
 Depth to Water Tape: Solinst S/N: 312386

QC SAMPLE: MS/MSD DUP- Sonde ID: 08C 11M 15H 19M

Depth-to-water T/PVC (ft) 10.73 Depth-To-Bottom T/PVC (ft) _____ Completed by dmw

Time	pH	Temp	Sp Cond	DO	DO	ORP	Pump Rate	Water level	Turbidity
min	units	°C	uS/cm	% sat.	ppm	mV	mL/min	Drawdown ft	NTU
3-5 min	+/- 0.1	NA	+/- 3%	+/- 10%	+/- 0.3ppm	+/- 10mV	*	< 0.33	+/- 10%

Stabilization parameters for the last three readings

1225								10.74	
1230	6.98	8.33	264	48.5	5.67	+187.1	200	10.74	0.0
1235	6.97	8.18	254	35.9	4.22	+196.4	200	10.74	0.0
1240	6.91	8.19	253	33.5	3.94	+195.7	200	10.74	0.0
1245	6.73	8.12	244	30.0	3.53	+196.5	200	10.74	0.0
1250	6.57	8.12	217	26.9	3.18	+189.6	200	10.74	0.0
1255	6.41	8.04	204	26.8	3.17	+189.7	200	10.74	0.0
1300	6.39	7.96	195	26.7	3.16	+189.8	200	10.74	0.0
1305	6.35	8.10	186	25.2	2.98	+191.6	200	10.74	0.0
1310	6.35	8.12	184	24.4	2.88	+189.8	200	10.74	0.0
1315	6.35	8.14	185	24.2	2.86	+189.4	200	10.74	0.0
1316									
1327									

Total Pump Time (min): 46 Total Purge Volume (gal): 2.5 Reviewed by: EB

Weather: Sunny, 37°F 04-27-20

Comments:

Bottles Filled		Preservative Codes: A - NONE B - HNO3 C - H2SO4 D - NaOH E - HCl F -							
Quantity	Size	Type	Preservative Code	Filtered Y/N	Quantity	Size	Type	Preservative Code	Filtered Y/N
1	125 ml	HORE	A	N					
1	↓		B	N					
1	250 ml	↓	A	N					
2	1L		B	N					

* Pump rate should be <500 mL/min for low-flow and <1 gal/min for high Volume.

Consumers Energy Company
 Monitoring Well Sampling Worksheet

Well ID JHC MW-15028 Date 4.16.20 Control Number 20-0395-06
 Location JH Campbell Well Material: PVC SS Iron Galv. Steel
 Purge Method: Peristaltic Submersible Fultz Bailor
 Depth to Water Tape: Solinist S/N: 312386

QC SAMPLE: MS/MSD DUP- Sonde ID: 08C 11M 15H 19M

Depth-to-water T/PVC (ft) 11.22 Depth-To-Bottom T/PVC (ft) _____ Completed by DMW

Time	pH	Temp	Sp Cond	DO	DO	ORP	Pump Rate	Water level	Turbidity
min	units	°C	uS/cm	% sat.	ppm	mV	mL/min	Drawdown ft	NTU
3-5 min	+/- 0.1	NA	+/- 3%	+/- 10%	+/- 0.3ppm	+/- 10mV	*	< 0.33	+/- 10%

Stabilization parameters for the last three readings

1349								11.22	
1354	6.63	9.37	48	80.0	9.17	+167.5	200	11.22	7.2
1359	5.69	9.07	51	73.4	8.47	+195.9	200	11.22	0.0
1404	5.53	8.89	64	68.2	7.91	+206.3	200	11.22	0.0
1409	5.72	8.84	73	66.0	7.66	+198.2	200	11.22	0.0
1414	5.87	8.91	78	64.0	7.41	+195.5	200	11.22	0.0
1419	5.95	8.77	81	63.1	7.33	+193.1	200	11.22	0.0
1424	6.01	8.82	82	62.7	7.29	+190.6	200	11.22	0.0
1429	6.04	8.79	82	61.4	7.13	+186.4	200	11.22	0.0
1430									
1441									

Total Pump Time (min): 41 Total Purge Volume (gal): 2.2 Reviewed by: EB

Weather: Sunny; 37°F 04-27-20

Comments:

Bottles Filled		Preservative Codes: A - NONE B - HNO3 C - H2SO4 D - NaOH E - HCl F - _____							
Quantity	Size	Type	Preservative Code	Filtered Y/N	Quantity	Size	Type	Preservative Code	Filtered Y/N
1	125 ml	HDPE	A	N					
1	↓		B	N					
1	250 ml	↓	A	N					
2	1L		B	N					

* Pump rate should be <500 mL/min for low-flow and <1 gal/min for high Volume.

Consumers Energy Company
 Monitoring Well Sampling Worksheet

Well ID MW-145 Date 4-16-20 Control Number 20-0405-01
 Location JHC Well Material: PVC SS Iron Galv. Steel
 Purge Method: Peristaltic Submersible Fultz Bailor
 Depth to Water Tape: Geotech S/N: 1005

QC SAMPLE: MS/MSD DUP- Sonde ID: 08C 11M 15H 19M

Depth-to-water T/PVC (ft) 8.71 Depth-To-Bottom T/PVC (ft) NM Completed by CET

Time	pH	Temp	Sp Cond	DO	DO	ORP	Pump Rate	Water level	Turbidity
min	units	°C	uS/cm	% sat.	ppm	mV	mL/min	Drawdown ft	NTU
3-5 min	+/- 0.1	NA	+/- 3%	+/- 10%	+/- 0.3ppm	+/- 10mV	*	< 0.33	+/- 10%

Stabilization parameters for the last three readings

1458							180 +180 CET 4/16/20	8.75	
1500	5.29	7.9	21.8	64.3	7.61	120.2	180	8.75	1.96
1505	5.02	7.9	23.9	39.3	4.65	131.0	180	8.75	2.24
1510	5.00	7.9	23.8	35.3	4.19	135.3	180	8.75	2.10
1515	4.98	7.8	23.7	33.5	3.98	140.3	180	8.75	2.04
1520	4.99	8.1	23.8	32.5	3.85	143.9	180	8.75	1.58
1525	4.99	8.2	23.9	31.6	3.75	148.0	180	8.75	1.65
1530	5.04	8.4	24.0	31.7	3.71	149.0	180	8.75	1.61
1535	5.03	8.5	24.2	31.8	3.72	152.4	180	8.75	1.63
CET 4/16/20 1536 1544									
1547									

Total Pump Time (min): 49 Total Purge Volume (gal): 2.0 gal Reviewed by: EB

Weather: _____ 04-27-20

Comments:

Bottles Filled		Preservative Codes: A - NONE B - HNO3 C - H2SO4 D - NaOH E - HCl F - _____							
Quantity	Size	Type	Preservative Code	Filtered Y/N	Quantity	Size	Type	Preservative Code	Filtered Y/N
1	125 ml	B HOPE	B	N					
1	↓	CET 4/16/20 A ↓	A	↓					
1	250 ml	A ↓	A	↓					
2	1000 ml	B ↓	B	↓					

* Pump rate should be <500 mL/min for low-flow and <1 gal/min for high Volume.

Consumers Energy Company
Monitoring Well Sampling Worksheet

Well ID PZ-245 Date 4-16-20 Control Number 20-0405-02
 Location JAC Well Material: PVC SS Iron Galv. Steel
 Purge Method: Peristaltic Submersible Fultz Bailor
 Depth to Water Tape: Gootech S/N: 1005

QC SAMPLE: MS/MSD DUP- Sonde ID: 08C 11M 15H 19M

Depth-to-water T/PVC (ft) 8.88 Depth-To-Bottom T/PVC (ft) NM Completed by CE

Time	pH	Temp	Sp Cond	DO	DO	ORP	Pump Rate	Water level	Turbidity
min	units	°C	uS/cm	% sat.	ppm	mV	mL/min	Drawdown ft	NTU
3-5 min	+/- 0.1	NA	+/- 3%	+/- 10%	+/- 0.3ppm	+/- 10mV	*	< 0.33	+/- 10%

Stabilization parameters for the last three readings

1325							200	6.92	
1327	6.01	7.3	29.9	46.4	5.58	24.6	200	6.92	2.25
1332	4.63	7.2	20.3	38.2	4.69	64.9	200	6.92	1.75
1337	4.52	7.7	21.3	35.3	4.22	76.5	200	6.92	1.61
1342	4.57	7.3	22.2	33.4	4.00	61.1	200	6.92	1.61
1347	4.62	7.1	23.3	31.9	3.83	86.4	200	6.92	1.62
1352	4.71	7.6	25.3	30.1	3.59	94.0	200	6.92	1.79
1357	4.74	7.4	25.8	29.7	3.56	96.7	200	6.92	1.56
1402	4.82	7.5	27.6	28.5	3.42	101.2	200	6.92	1.51
1407	4.86	7.2	28.8	28.0	3.38	103.4	300	6.92	1.42
1412	4.87	7.2	28.8	28.8	3.48	103.9	300	6.92	1.50
1417	4.89	7.0	29.4	28.2	3.42	107.6	300	6.92	1.36
1422	4.90	7.0	29.6	27.9	3.38	108.1	300	6.92	1.34
1427	4.94	7.0	30.3	27.2	3.30	107.7	300	6.92	1.34
1432	4.97	7.1	30.9	26.8	3.24	107.6	300	6.92	1.33

Total Pump Time (min): 78 Total Purge Volume (gal): 4.0 gal Reviewed by: EB

Weather: 04-27-20

Comments:

Bottles Filled		Preservative Codes: A - NONE B - HNO3 C - H2SO4 D - NaOH E - HCl F -							
Quantity	Size	Type	Preservative Code	Filtered Y/N	Quantity	Size	Type	Preservative Code	Filtered Y/N
1	125ml	HDPE	B	✓					
1	↓	↓	A	↓					
1	250ml	↓	A	↓					
2	1000ml	↓	B	✓					

* Pump rate should be <500 mL/min for low-flow and <1 gal/min for high Volume.

Consumers Energy Company
Monitoring Well Sampling Worksheet

Well ID PZ-405 Date 4/16/20 Control Number 20-0405-03
 Location JHC Well Material: PVC SS Iron Galv. Steel
 Purge Method: Peristaltic Submersible Fultz Bailer
 Depth to Water Tape: Geotech S/N: 1005

QC SAMPLE: MS/MSD DUP-05 Sonde ID: 08C 11M 15H 19M

Depth-to-water T/PVC (ft) 9.94 Depth-To-Bottom T/PVC (ft) NM Completed by CT

Time	pH	Temp	Sp Cond	DO	DO	ORP	Pump Rate	Water level	Turbidity
min	units	°C	uS/cm	% sat.	ppm	mV	mL/min	Drawdown ft	NTU
3-5 min	+/- 0.1	NA	+/- 3%	+/- 10%	+/- 0.3ppm	+/- 10mV	*	< 0.33	+/- 10%

Stabilization parameters for the last three readings

1000							200	9.97	
1001	4.73	6.6	25.0	26.6	3.26	116.3	200	9.98	2.36
1006	4.32	6.4	22.4	22.3	2.75	139.1	200	9.98	2.07
1011	4.29	6.2	22.0	19.7	2.45	149.4	200	9.98	1.98
1016	4.28	6.8	18.7 21.8	18.7	2.26	158.5	200	9.98	1.98
1021	4.28	6.8	16.1 21.8	16.1	1.96	169.5	200	9.98	1.66
1026	4.30	7.1	22.0	14.2	1.73	181.6	200	9.98	1.57
1031	4.33	6.9	22.1	13.6	1.64	173.1	280	9.98	1.64
1036	4.44	6.8	22.3	13.0	1.58	168.6	280	9.98	1.44
1041	4.36	7.1	22.6	12.0	1.55	185.6	300	9.98	1.53
1046	4.38	7.1	22.7	11.4	1.44	189.6	300	9.98	1.43
1051	4.38	7.0	22.8	11.0	1.31	195.2	300	9.98	1.42
1056	4.39	7.0	22.8	10.3	1.26	197.1	300	9.98	1.37
1101	4.40	7.0	22.8	10.7	1.29	198.3	300	9.98	1.41
1102									
1119									

Total Pump Time (min): 79 Total Purge Volume (gal): 4.0 gal Reviewed by: EB

Weather: 04-27-20

Comments: Dry 11M pH 4.54 @ time of sample / 15H 3.88 @ 4 standard / 19 pH 4.68 / 8.82 @ 9 standard / recilled sons 15H

Bottles Filled		Preservative Codes: A - NONE B - HNO3 C - H2SO4 D - NaOH E - HCl F -							
Quantity	Size	Type	Preservative Code	Filtered Y/N	Quantity	Size	Type	Preservative Code	Filtered Y/N
2	125ml	HDPE	B	N					
2	↓	↓	A	↓					
2	250ml	↓	A	↓					
4	1000ml	↓	B	↓					

* Pump rate should be <500 mL/min for low-flow and <1 gal/min for high Volume.

Consumers Energy Company
 Monitoring Well Sampling Worksheet

Well ID PZ-235 Date 4-16-20 Control Number 20-0405-07
 Location JHC Well Material: PVC SS Iron Galv. Steel
 Purge Method: Peristaltic Submersible Fultz Bailer
 Depth to Water Tape: Geotech S/N: 1005

QC SAMPLE: MS/MSD DUP- Sonde ID: 08C 11M 15H 19M

Depth-to-water T/PVC (ft) 14.85 Depth-To-Bottom T/PVC (ft) NM Completed by CE

Time	pH	Temp	Sp Cond	DO	DO	ORP	Pump Rate	Water level	Turbidity
min	units	°C	uS/cm	% sat.	ppm	mV	mL/min	Drawdown ft	NTU
3-5 min	+/- 0.1	NA	+/- 3%	+/- 10%	+/- 0.3ppm	+/- 10mV	*	< 0.33	+/- 10%

Stabilization parameters for the last three readings

1614							140	14.91	
1616	6.08	8.5	79.0	66.0	7.74	163.7	140	14.91	2.38
1621	6.26	8.4	64.6	71.9	8.44	158.1	140	14.91	2.32
1626	6.35	8.5	61.7	74.1	8.68	155.4	140	14.91	2.40
1631	6.44	8.4	61.0	73.9	8.67	152.5	140	14.91	2.00
1636	6.49	8.6	60.3	64.9 74.3 circled/20	8.72	150.6	140	14.91	1.94
1641	6.53	8.7	60.2	75.1	8.74	149.0	140	14.91	1.88
1646	6.57	8.9	60.7	75.4	8.74	147.8	140	14.91	1.84
1651	6.60	9.0	60.3	75.8	8.77	147.2	140	14.91	1.82
1652									
1708									

Total Pump Time (min): 54 Total Purge Volume (gal): 1.5 gal Reviewed by: ES

Weather: _____ 04-27-20

Comments:

Bottles Filled		Preservative Codes: A - NONE B - HNO3 C - H2SO4 D - NaOH E - HCl F - _____							
Quantity	Size	Type	Preservative Code	Filtered Y/N	Quantity	Size	Type	Preservative Code	Filtered Y/N
1	125 ml	HOPE	B	N					
1	↓	↓	A	↓					
1	250 ml	↓	A	↓					
2	1000 ml	↓	B	↓					

* Pump rate should be <500 mL/min for low-flow and <1 gal/min for high Volume.

Appendix B

Second Semiannual Monitoring Report



2020 Semiannual Groundwater Monitoring Report and Fourth Quarter Hydrogeological Monitoring Report

JH Campbell Power Plant
Pond A CCR Unit

West Olive, Michigan

January 2021

A handwritten signature in black ink, reading "Sarah B. Holmstrom".

Sarah B. Holmstrom, P.G.
Project Manager/Hydrogeologist

Prepared For:

Consumers Energy

Prepared By:

TRC
1540 Eisenhower Place
Ann Arbor, Michigan 48108

A handwritten signature in black ink, reading "Kristin Lowery".

Kristin Lowery, E.I.T.
Project Engineer

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APPENDICES

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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 Pond A CCR Unit at the JH Campbell Power Plant Site (JHC Pond A).

On December 28, 2018, the State of Michigan enacted Public Act No. 640 of 2018 (PA 640) to amend the Natural Resources and Environmental Protection Act, also known as Part 115 of PA 451 of 1994, as amended (a.k.a., Michigan Part 115 Solid Waste Management). On March 18, 2019, Consumers Energy submitted the *Pond A Hydrogeological Monitoring Plan, JH Campbell Power Plant, West Olive, Michigan* (Pond A HMP) (TRC, March 2019; Revised July 2019), which includes the *Pond A Assessment Monitoring Plan* (Pond A AMP), to the EGLE to comply with the requirements of Part 115, Rule 299.4905 and the December 21, 2018 Consent Agreement No. 115-01-2018. The Pond A HMP and AMP were revised per EGLE comments on July 30, 2019 and approved by EGLE on August 13, 2019.

On behalf of Consumers Energy, TRC has prepared this 2020 Semiannual Groundwater Monitoring Report and Fourth Quarter 2020 Hydrogeological Monitoring Report for the JH Campbell Pond A CCR Unit (Semiannual Report) to cover the semiannual groundwater monitoring conducted in October 2020 to comply with the CCR Rule and the Pond A HMP and AMP. Pond A remains in assessment monitoring. Given the alignment of PA 640 to comply with the CCR Rule and the congruencies between the two programs, data collected and evaluated under both programs are presented together in this report.

1.1 Statement of Adherence to Approved Hydrogeological Monitoring Plan

This Semiannual Report has been prepared by TRC on behalf of Consumers Energy to present groundwater monitoring data collected from the JH Campbell Pond A. This report was prepared in accordance with the items listed in Appendix A (Solid Waste Monitoring Submittal Components) of the May 15, 2015 Michigan Department of Environmental Quality - Office of Waste Management and Radiological Protection (MDEQ-OWMRP), now the Michigan Department of Environment, Great Lakes, and Energy (EGLE) Materials Management Division (MMD) communication prescribing the format for solid waste disposal facility monitoring submittals as published in OWMRP-115-29, dated July 5, 2013 Format for Solid Waste Disposal Monitoring Submittals. All references herein to the EGLE are inclusive of the MDEQ. Information contained in this report was prepared in adherence to the July 2019 Pond A HMP and AMP, approved by the EGLE on August 13, 2019.

1.2 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, Pond A CCR Unit* (TRC, January 2018). The statistical evaluation of the Appendix III indicator parameters confirming SSIs over background were as follows:

- Boron at JHC-MW-15006, JHC-MW-15007, JHC-MW-15008, JHC-MW-15009, JHC-MW-15010, and JHC-MW-15011; and
- Sulfate at JHC-MW-15006, JHC-MW-15007, JHC-MW-15008, JHC-MW-15009, JHC-MW-15010, and JHC-MW-15011.

As discussed in the *2018 Annual Groundwater Monitoring Report for the JH Campbell Power Plant Pond A CCR Unit* (2018 Annual Report) (TRC, January 2019), Consumers Energy initiated an Assessment Monitoring Program for Pond A pursuant to §257.95 of the CCR Rule that included sampling and analyzing groundwater within the groundwater monitoring system for all constituents listed in Appendix III and Appendix IV. After subsequent sampling for Appendix IV constituents, Consumers Energy provided notification that arsenic was present at statistically significant levels above the federal groundwater protection standards (GWPS) established at 10 ug/L (TRC, 2019) in one out of six downgradient monitoring wells at Pond A as follows:

- Arsenic at JHC-MW-15011.

The CCR Rule 40 CFR §257.96(a) requires that an owner or operator initiate an assessment of corrective measures (ACM) 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* (ACM) (TRC, September 2019) was initiated on April 15, 2019 and was certified and submitted to the EGLE on September 11, 2019 in accordance with the schedule in §257.96. In addition, Consumers Energy is preparing a site-wide remedial action plan (RAP) for the JH Campbell site per the Consent Agreement No. 115-01-2018 executed by Consumers Energy and the EGLE on December 21, 2018.

Consumers Energy will continue to evaluate corrective measures in accordance with §257.96 and §257.97 as outlined in the ACM and will continue executing the self-implementing groundwater compliance schedule in conformance with §257.90 - §257.98, which includes semiannual assessment monitoring in accordance with §257.95. In addition, quarterly monitoring is performed in accordance with the Pond A HMP and AMP under Part 115. The initial implementation of the Pond A HMP and AMP was presented in the *2019 Annual Groundwater Monitoring and Corrective Action Report and Fourth Quarter 2019 Hydrogeological Monitoring Report* (2019 Annual Report) (TRC, January 2020). This Semiannual Report presents the results of the fourth quarter 2020 Pond A HMP and AMP event, which also serves as the second semiannual assessment monitoring event for 2020 conducted in accordance with §257.95.

1.3 Site Overview

The JH Campbell 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.

1.4 Geology/Hydrogeology

The upgradient/background wells are located to the north-northwest of the JHC Dry Ash Landfill. Groundwater is typically encountered around 30 to 35 feet below ground surface (ft bgs), except in the recently excavated areas of Bottom Ash Ponds 1-2 and Bottom Ash Pond 3 South where groundwater is now within 5 to 10 ft bgs due to grade changes, 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

Consumers Energy established a groundwater monitoring system for the JHC Pond A, which consists of 12 monitoring wells (six background monitoring wells and six 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 CCR management at the site (JHC-MW-15023 through JHC-MW-15028). The six downgradient wells (JHC-MW-15006, JHC-MW-15007, JHC-MW-15008R, JHC-MW-15009, JHC-MW-15010, and JHC-MW-15011) are located south and southeast of Pond A.

As shown on Figure 2, monitoring wells JHC-MW-15029 and JHC-MW-15030 are used for water level measurements only.

2.2 October 2020 Assessment Monitoring

Consumers Energy personnel performed gauging and sampling of monitoring wells associated with Pond A from October 19 through October 23, 2020. Groundwater monitoring was performed in accordance with the approved Pond A HMP and AMP and the *JH Campbell Monitoring Program Sample Analysis Plan (SAP)* (ARCADIS, May 2016). Groundwater samples collected during the October 2020 event were submitted to Consumers Energy Laboratory Services in Jackson, Michigan, for analysis of the following metals and inorganic indicator constituents:

Section 11511a(3)(c) – Detection Monitoring Constituents	Section 11519b(2) – Assessment Monitoring Constituents
Boron Calcium Chloride Fluoride Iron pH Sulfate Total Dissolved Solids (TDS)	Antimony Arsenic Barium Beryllium Cadmium Chromium, total Cobalt Copper Fluoride Lead Lithium Mercury Molybdenum

Section 11511a(3)(c) – Detection Monitoring Constituents	Section 11519b(2) – Assessment Monitoring Constituents
	Nickel Radium 226 and 228 Selenium Silver Thallium Vanadium Zinc

Static water level measurements were collected at all locations after equilibration to atmospheric pressure. The depth to water was measured according to ASTM D 4750, “Standard Test Method for Determining Subsurface Liquid Levels in a Borehole or Monitoring Well” and recorded to the nearest 0.01 foot. Static water elevation data are included in the attached field records (Appendix E) and summarized in Table 1.

Groundwater samples were collected using a peristaltic pump or submersible pump in accordance with low flow sampling protocol and were not field filtered to allow for total metals analysis. In addition, field parameters including dissolved oxygen, oxidation reduction potential, specific conductivity, temperature, and turbidity were collected at each well as shown on Table 2. All samples were collected in vendor-provided, nitric acid pre-preserved (metals only) and unpreserved sample containers and submitted to the laboratory for analysis. Consumers Energy followed chain of custody procedures to document the sample handling.

Monitoring wells JHC-MW-15007, JHC-MW-15009, JHC-MW-15010, and MW-13 had an insufficient amount of groundwater present to collect a sample during the October 2020 sampling event.

Consumers Energy collected quality assurance/quality control (QA/QC) samples during the October 2020 groundwater sampling event. The QA/QC samples consisted of two field blanks, two equipment blanks, three field duplicates (JHC-MW-15028, JHC-MW-15006, and MW-14S), and one field matrix spike/matrix spike duplicate (MS/MSD) samples collected from JHC-MW-15025.

2.2.1 Analytical Data and Relevant Screening Criteria

Analytical results from the fourth quarter 2020 monitoring event are included in the attached laboratory reports (Appendix D). Fourth quarter 2020 groundwater analytical data is summarized in Table 3 (background monitoring wells), Table 4 (downgradient monitoring wells), and Table 5 (GSI monitoring wells), as well as the associated Part 201 generic drinking water criteria and generic GSI criteria.

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 Pond A HMP and AMP program, with the exception of TDS for the GSI monitoring wells during the October 2020 event. The TDS data collected from the GSI wells during the October 2020 event varied significantly from historical data at the well locations and contained potential errors introduced from inaccurate pre-determined bag weights provided by the lab materials manufacturer; therefore, the TDS data at the GSI locations are considered unusable for the purposes of the monitoring program during the semiannual event. The data quality reviews for the Pond A network wells are summarized in Appendix A.

2.2.3 Groundwater Flow Rate and Direction

Groundwater elevations measured across the Site during the October 2020 event using several wells throughout the RCRA CCR well network are provided on Table 1. October 2020 groundwater elevations were used to construct the groundwater contour map provided on Figure 3. The average hydraulic gradient of 0.0040 ft/ft was calculated using the following well pairs: JHC-MW-15029/JHC-MW-15030, JHC-MW-15029/JHC-MW-15005, JHC-MW-15019/JHC-MW-15035 and JHC-MW-15023/JHC-MW-15037 (Figure 2). Using the mean hydraulic conductivity of 62 ft/day (ARCADIS, 2016) and an assumed effective porosity of 0.4, the estimated average seepage velocity is approximately 0.63 ft/day or 230 ft/year for the October 2020 event.

The general groundwater flow direction is similar to that identified in previous monitoring rounds and continues to demonstrate that the downgradient wells are appropriately positioned to detect the presence of constituents that could potentially migrate from Pond A.

3.0 Statistical Evaluation

Assessment monitoring is continuing at Pond A in accordance with the AMP and §257.95 while corrective measures are further 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 fourth quarter 2020 groundwater data in accordance with the assessment monitoring program. The statistical evaluation details are provided in Appendix B (*Statistical Evaluation of October 2020 Assessment Monitoring Sampling Event*).

3.1 Establishing Groundwater Protection Standards

The GWPSs are used to assess constituent concentrations present in groundwater as a result of CCR Unit operations by statistically comparing concentrations in the downgradient wells to the GWPSs for each detection and assessment monitoring constituent. The calculation of the Appendix IV GWPSs is documented in the *Groundwater Protection Standards* technical memorandum included in Appendix C of the 2018 Annual Report. Pursuant to the Pond A AMP, GWPSs were established for the Appendix III constituents and the Part 115 Section 11511a(3) constituents not included in Appendix III of the CCR Rule (i.e. iron) and Section 11519b(2) constituents not included in Appendix IV of the CCR Rule (i.e. copper, nickel, silver, vanadium, and zinc) in accordance with 40 CFR 257.95(h), as amended. The calculation of the Appendix III GWPSs is documented in the *Groundwater Protection Standards* technical memorandum included in Appendix G of the 2019 Annual Report. The calculation of the additional Part 115-specific constituent GWPSs is documented in the *PA 640 Constituent Groundwater Protection Standards* technical memorandum included in Appendix B of the *Third Quarter 2020 Hydrogeological Monitoring Report* (TRC, October 2020).

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)*, arsenic was present at statistically significant levels above the GWPSs in one of the six downgradient wells (JHC-MW-15011) at Pond A based on the statistical data comparison for the first semiannual assessment monitoring event (June 2018), included as Appendix D of the 2019 Annual Report.

The fourth quarter 2020 statistical evaluation indicates that arsenic at JHC-MW-15011, in addition to the statistically evaluated Part 115 constituents boron at JHC-MW-15010 and vanadium at JHC-MW-15006 and JHC-MW-15011, are present at statistically significant levels above the GWPSs. Arsenic was identified at downgradient monitoring well JHC-MW-15011 at statistically significant levels exceeding the GWPS during the initial assessment monitoring event conducted in June 2018. As shown in the data tables and trend tests included in Appendix B, arsenic concentrations at JHC-MW-15011 have begun to decline in 2020 but remain above the GWPS. Boron at JHC-MW-15010 was identified at statistically significant levels exceeding the GWPS in the third quarter 2020 monitoring event. Boron concentrations at

monitoring well JHC-MW-15010 showed an initial increase in 2019, around the timing of the completion of Pond A capping activities and have remained generally stable in 2019 and 2020. Vanadium concentrations at JHC-MW-15006 and JHC-MW-15011 have been generally stable at levels above the GWPS since monitoring for vanadium began in fourth quarter 2019. The addition of the fourth quarter 2020 monitoring event data to the dataset provided sufficient confidence that vanadium exceeds the GWPS.

No other constituents were observed at statistically significant levels exceeding the GWPSs in downgradient monitoring wells at the JHC Pond A during the fourth quarter 2020. A summary of the confidence intervals for October 2020 are provided in Table 6. Table 7 provides a summary of the statistically significant GWPS exceedances over the most recent four monitoring events.

Groundwater chemistry is currently changing as a result of closure activities performed at Pond A. As discussed in the ACM, Pond A has been decommissioned with final cover in place in the summer of 2019, and groundwater flow direction has changed such that groundwater generally flows to the south-southeast and mounding is no longer observed as it had been when hydraulic loading was actively taking place. The cessation of hydraulic loading and recharge of the aquifer are expected to have an influence on groundwater conditions, and many Appendix III and Appendix IV, and Part 115-specific constituents may be affected by this change. Groundwater conditions will continue to be monitored while corrective measures continue to be evaluated and a remedy is selected. Continued groundwater monitoring may reduce uncertainty surrounding the potential changes in groundwater oxidation-reduction conditions and the effect on contaminant transport. These observations will be critical for the comparison of corrective measures alternatives.

3.3 GSI Compliance Monitoring Trends

Pursuant to the AMP, trend tests will be used to evaluate groundwater quality at the GSI monitoring wells. The GSI monitoring wells will be evaluated for detected constituents (antimony, arsenic, barium, chromium (total), lithium, molybdenum, and selenium) that, based on monitoring data from Pond A, have the potential to exceed generic GSI criteria at the Pond A downgradient monitoring wells as detailed in the AMP. Groundwater data collected from the Pond A wells indicates the presence of TDS and vanadium above generic GSI criterion in one or more of the Pond A wells (e.g. JHC-MW-15011) (Table 4). Given that TDS and vanadium data at the Pond A monitoring wells are above the generic GSI criterion for several consecutive quarterly events, vanadium and TDS will be added to the list of constituents evaluated at the GSI compliance wells associated with the Pond A AMP.

Separately, TDS and vanadium were analyzed at the GSI compliance wells in the fourth quarter as part of supplemental sampling in support of the site-wide RAP. As such, the vanadium data has been included in the fourth quarter data summary table (Table 5) and shows that vanadium concentrations in groundwater are detected at levels below or slightly above the laboratory reporting limit, well below the GSI criterion. As discussed in Section 2.2.2 and noted on Table 5, TDS data collected from the GSI wells for the October 2020 event were determined to be unusable and are not included in Table 5, however, data collected from the GSI wells during

previous events have remained well below GSI criteria as shown in Appendix C and will be confirmed as such in the upcoming 2021 sampling events. Although boron concentrations have shown an increase at several of the Pond A wells subsequent to capping activities (discussed above in Section 3.2), the boron concentrations at the Pond A boundary remain well below the associated GSI criterion (Table 4).

Time-series plots for the GSI monitoring wells MW-13, MW-14S, PZ-24S, and PZ-40S, including assessment monitoring data collected from June 2018 through October 2020¹ for the aforementioned GSI monitoring constituents detailed in the Pond A AMP, are included in Appendix C. In accordance with the Pond A AMP, the detected constituents at the GSI monitoring wells were evaluated using trend analysis. Specifically, the Mann-Kendall test for trend was performed at a significance level (α) of 0.01 per tail for each constituent/sampling point dataset to assess trends. Sen's Slope estimator was used to assess the magnitude of the slope and the Mann-Kendall test was used to determine if the slope was statistically significant. Trend analysis was not performed on constituent/sampling point datasets that were primarily not detected. The trend analysis shows that there are no statistically significant trends at the GSI wells.

All of the constituent concentrations at the GSI monitoring wells are below their respective Part 201 generic GSI criteria in October 2020 (Table 5) and there are no statistically significant trends based on the trend analysis (Appendix C).

¹ An insufficient amount of groundwater was present in February and April 2020 to collect samples for total metals for MW-13. Select dissolved metal results collected at MW-13 in accordance with the JH Campbell Dry Ash Landfill Hydrogeological Monitoring Plan (HMP) are included in the time-series plots for February and April 2020.

4.0 Conclusions and Recommendations

Assessment monitoring is ongoing at Pond A while corrective action continues to be assessed. Pond A has been decommissioned and the final cover has been placed. The statistical evaluations have confirmed that arsenic is the only Appendix IV constituent present at statistically significant levels above the GWPSs. In addition, boron and vanadium exceeds the GWPSs established under the Part 115-specific program. Compliance for the GSI pathway is currently met based on data collected from the GSI monitoring wells located downgradient from Pond A.

The ACM also documents that groundwater nature and extent of arsenic has been defined, as required in §257.95(g)(1). Although arsenic concentrations had exceeded 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 Pond A.

Consumers Energy also completed the final cover for Pond A in summer of 2019. The ACM report provided a high-level assessment of groundwater remediation technologies that could potentially address site-specific constituents of concern (i.e. arsenic) under known groundwater conditions. Changes in groundwater chemistry continue to be evaluated following the completion of capping at Pond A. Groundwater monitoring in 2021 will reduce uncertainty surrounding potential changes in groundwater oxidation-reduction conditions and the effect on contaminant transport. These observations will be critical for the comparison of corrective measures alternatives.

Consumers Energy will continue to evaluate corrective measures in accordance with §257.96 and §257.97. The groundwater management remedy for the JH Campbell Pond A will be selected as soon as feasible to, at a minimum, meet the federal standards of §257.97(b) of the CCR Rule. Consumers Energy will continue executing the self-implementing groundwater compliance schedule in conformance with §257.90 - §257.98. The next quarterly Pond A HMP and AMP monitoring event, is scheduled for the first calendar quarter of 2021. The next semiannual assessment monitoring event in accordance with §257.95 is scheduled for the second calendar quarter of 2021.

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USEPA. July 2018. 40 CFR Part 257. Hazardous and Solid Waste Management System: Disposal of Coal Combustion Residuals from Electric Utilities; Amendments to the National Minimum Criteria (Phase One, Part One); Final Rule. 83 Federal Register 146 (July 30, 2018), pp. 36435-36456 (83 FR 36435).

USEPA. April 2018. Barnes Johnson (Office of Resource Conservation and Recovery) to James Roewer (c/o Edison Electric Institute) and Douglas Green, Margaret Fawal (Venable LLP). Re: Coal Combustion Residuals Rule Groundwater Monitoring Requirements. April 30, 2018. United States Environmental Protection Agency, Washington, D.C. 20460. Office of Solid Waste and Emergency Response, now the Office of Land and Emergency Management.

Tables

Table 1
 Summary of Groundwater Elevation Data – Fourth Quarter 2020
 JH Campbell – Assessment Monitoring Program
 West Olive, Michigan

Well Location	Ground Surface Elevation (ft)	TOC Elevation (ft)	Geologic Unit of Screen Interval	Screen Interval Elevation (ft)	October 19, 2020		
					Depth to Water (ft BTOC)	Groundwater Elevation (ft)	
Background							
JHC-MW-15023	617.01	619.98	Sand	603.0 to 593.0	17.70	602.28	
JHC-MW-15024	613.79	616.62	Sand	606.8 to 596.8	12.49	604.13	
JHC-MW-15025	614.14	617.17	Sand	607.1 to 597.1	11.40	605.77	
JHC-MW-15026	615.09	618.04	Sand	607.1 to 597.1	12.90	605.14	
JHC-MW-15027	614.77	617.30	Sand	604.8 to 594.8	13.13	604.17	
JHC-MW-15028	611.02	613.80	Sand	603.0 to 593.0	12.75	601.05	
JHC-MW-15029	608.08	610.95	Sand	600.1 to 590.1	10.57	600.38	
JHC-MW-15030	604.05	607.17	Sand	600.1 to 590.1	9.17	598.00	
Pond 1N, 1S, 2N, 2S							
JHC-MW-15001	607.02	609.53	Sand	603.5 to 598.5	11.78	597.75	
JHC-MW-15002	618.18	621.27	Sand	590.2 to 580.2	24.61	596.66	
JHC-MW-15003	623.16	627.20	Sand	595.2 to 585.2	32.94	594.26	
JHC-MW-15005	606.22	609.99	Sand	579.2 to 569.2	18.27	591.72	
JHC-MW-18004	602.92	605.72	Sand	596.9 to 586.9	12.17	593.55	
JHC-MW-18005	600.30	603.16	Sand	595.3 to 585.3	10.69	592.47	
Pond 3N, 3S							
JHC-MW-15013	632.40	635.25	Sand	604.4 to 594.4	34.98	600.27	
JHC-MW-15015	632.46	635.20	Sand	604.5 to 594.5	34.13	601.07	
JHC-MW-15016	631.81	632.52	Sand	603.8 to 593.8	31.46	601.06	
JHC-MW-18001	609.09	611.98	Sand	603.1 to 593.1	11.71	600.27	
JHC-MW-18002	605.53	608.93	Sand	602.0 to 592.0	8.88	600.05	
JHC-MW-18003	605.36	608.78	Sand	601.9 to 591.9	8.86	599.92	
Landfill							
JHC-MW-15017	613.69	616.61	Sand	603.7 to 593.7	14.54	602.07	
JHC-MW-15018	614.26	617.02	Sand	604.3 to 594.3	15.23	601.79	
JHC-MW-15019	609.81	612.86	Sand	603.8 to 593.8	11.66	601.20	
JHC-MW-15022	620.92	623.79	Sand	597.9 to 587.9	28.78	595.01	
JHC-MW-15031	632.94	635.87	Sand	599.9 to 589.9	42.82	593.05	
JHC-MW-15032	611.32	614.29	Sand	598.3 to 588.3	17.15	597.14	
JHC-MW-15033	618.08	620.99	Sand	602.1 to 592.1	22.07	598.92	
JHC-MW-15034	612.90	615.97	Sand	601.9 to 591.9	15.90	600.07	
JHC-MW-15035	632.53	634.28	Sand	599.5 to 589.5	40.09	594.19	
JHC-MW-15036	617.94	618.34	Sand	597.9 to 587.9	26.41	591.93	
JHC-MW-15037	614.28	616.06	Sand	591.3 to 586.3	24.95	591.11	
Pond A							
JHC-MW-15006	624.74	627.58	Sand	599.7 to 589.7	34.98	592.60	
JHC-MW-15007	624.82	627.70	Sand	602.8 to 592.8	Dry		
JHC-MW-15008	632.43	635.30	Sand	604.4 to 594.4	Decommissioned		
JHC-MW-15008R ⁽¹⁾	632.32	634.67	Sand	597.3 to 587.3	42.98	591.69	
JHC-MW-15009	632.33	635.32	Sand	602.3 to 592.3	Dry		
JHC-MW-15010	632.55	635.57	Sand	602.6 to 592.6	42.38	593.19	
JHC-MW-15011	627.71	630.83	Sand	600.7 to 590.7	38.71	592.12	
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	9.02	581.96	
PZ-23S	602.84	604.97	Sand	591.8 to 586.8	15.34	589.63	
PZ-24S	586.56	590.15	Sand	584.6 to 579.6	7.53	582.62	
PZ-40S	589.51	593.25	Sand	585.5 to 575.5	10.91	582.34	
TW-19-04A	608.15	611.44	Sand	591.2 to 586.2	22.15	589.29	
TW-19-05	603.44	606.36	Sand	592.8 to 587.8	16.14	590.22	
TW-19-06A	599.61	602.54	Sand	592.3 to 587.3	13.44	589.10	

Notes:

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

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.

--: Not measured

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

Table 2
 Summary of Field Parameters: Fourth Quarter 2020
 JH Campbell Pond A - Assessment 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	10/20/2020	0.62	225.8	5.5	74	12.1	9.4
JHC-MW-15024	10/20/2020	0.28	116.1	6.9	308	11.9	9.1
JHC-MW-15025	10/20/2020	1.42	136.7	6.6	262	12.0	9.2
JHC-MW-15026	10/20/2020	3.77	138.1	6.4	127	11.5	8.6
JHC-MW-15027	10/20/2020	1.87	94.3	6.0	81	11.0	5.7
JHC-MW-15028	10/20/2020	4.92	101.4	7.3	82	12.5	7.6
Pond A							
JHC-MW-15006	10/22/2020	0.62	-55.4	7.5	790	15.0	8.8
JHC-MW-15007	10/22/2020 ⁽¹⁾	--	--	--	--	--	--
JHC-MW-15008R	10/22/2020	1.59	45.2	7.0	880	14.4	8.6
JHC-MW-15009	10/22/2020 ⁽¹⁾	--	--	--	--	--	--
JHC-MW-15010	10/22/2020 ⁽¹⁾	--	--	--	--	--	--
JHC-MW-15011	10/22/2020	0.35	-46.1	7.6	800	14.7	4.9
Pond A GSI							
MW-13	10/20/2020 ⁽¹⁾	--	--	--	--	--	--
MW-14S	10/20/2020	1.62	171.8	5.2	20	12.7	9.3
PZ-24S	10/21/2020	1.53	123.5	5.2	29	13.2	7.8
PZ-40S	10/21/2020	0.35	215.2	4.6	17	10.8	9.5

Notes:

mg/L - Milligrams per Liter.

mV - Millivolts.

SU - Standard Units.

umhos/cm - Micromhos per centimeter.

°C - Degrees Celcius.

NTU - Nephelometric Turbidity Unit.

-- - Not Measured.

(1) - Not sampled; insufficient amount of groundwater present to collect sample.

Table 3
 Summary of Groundwater Sampling Results (Analytical): Fourth Quarter 2020
 JH Campbell Background – Assessment 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:	10/20/2020	10/20/2020	10/20/2020	10/20/2020	10/20/2020	10/20/2020
Constituent	Unit	EPA MCL	MI Residential*	MI Non-Residential*	MI GSI^							
Appendix III												
Boron	ug/L	NC	500	500	7,200	71	35	33	25	< 20	< 20	
Calcium	mg/L	NC	NC	NC	500 ⁽²⁾	11.1	39.0	23.2	17.1	12.9	17.4	
Chloride	mg/L	250**	250 ⁽¹⁾	250 ⁽¹⁾	500 ⁽²⁾	1.60	17.1	22.6	5.33	< 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**	250 ⁽¹⁾	250 ⁽¹⁾	500 ⁽²⁾	10.1	8.93	9.82	7.87	6.54	6.15	
Total Dissolved Solids	mg/L	500**	500 ⁽¹⁾	500 ⁽¹⁾	500	57	181	142	75	49	68	
pH, Field	SU	6.5 - 8.5**	6.5 - 8.5⁽¹⁾	6.5 - 8.5⁽¹⁾	6.5 - 9.0	5.5	6.9	6.6	6.4	6.0	7.3	
Appendix IV												
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	21	20	11	14	14	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	< 0.262	< 0.294	< 0.269	< 0.264	< 0.368	< 0.258	
Radium-228	pCi/L	NC	NC	NC	NC	< 0.182	< 0.582	< 0.209	< 0.364	< 0.411	0.346	
Radium-226/228	pCi/L	5	NC	NC	NC	< 0.262	< 0.582	< 0.269	< 0.364	< 0.411	0.403	
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	
MI Part 115 Parameters												
Iron	ug/L	300**	300⁽¹⁾	300⁽¹⁾	500,000 ⁽²⁾	177	664	20	39	194	33	
Copper	ug/L	1,000**	1,000 ⁽¹⁾	1,000 ⁽¹⁾	15	< 1	2	1	< 1	< 1	< 1	
Nickel	ug/L	NC	100	100	86	< 2	< 2	< 2	< 2	< 2	< 2	
Silver	ug/L	100**	34	98	0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	
Vanadium	ug/L	NC	4.5	62	27	< 2	< 2	< 2	< 2	< 2	< 2	
Zinc	ug/L	5,000**	2,400	5,000 ⁽¹⁾	190	< 10	< 10	< 10	< 10	< 10	< 10	

Notes:

ug/L - micrograms per liter.

mg/L - milligrams per liter.

SU - standard units; pH is a field parameter.

pCi/L - picocuries per liter.

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 30, 2013.

** - 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 EGLE policy and procedure 09-014 dated June 20, 2012.

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.

(1) - Criterion is the aesthetic drinking water value per footnote {E}.

(2) - Criterion is based on the total dissolved solids GSI value per footnote {EE}.

Table 4
 Summary of Groundwater Sampling Results (Analytical): Fourth Quarter 2020
 JH Campbell Pond A – Assessment Monitoring Program
 West Olive, Michigan

						Sample Location:	JHC-MW-15006	JHC-MW-15007	JHC-MW-15008R	JHC-MW-15009	JHC-MW-15010	JHC-MW-15011
						Sample Date:	10/22/2020	10/22/2020 ⁽³⁾	10/22/2020	10/22/2020 ⁽³⁾	10/22/2020 ⁽³⁾	10/22/2020
Constituent	Unit	EPA MCL	MI Residential*	MI Non-Residential*	MI GSI [^]							
Appendix III												
Boron	ug/L	NC	500	500	7,200	272	--	285	--	--	--	4,120
Calcium	mg/L	NC	NC	NC	500 ⁽²⁾	87.2	--	109	--	--	--	122
Chloride	mg/L	250**	250 ⁽¹⁾	250 ⁽¹⁾	500 ⁽²⁾	22.0	--	18.8	--	--	--	3.79
Fluoride	ug/L	4,000	NC	NC	NC	< 1,000	--	< 1,000	--	--	--	< 1,000
Sulfate	mg/L	250**	250⁽¹⁾	250⁽¹⁾	500 ⁽²⁾	253	--	215	--	--	--	141
Total Dissolved Solids	mg/L	500**	500⁽¹⁾	500⁽¹⁾	500	515	--	577	--	--	--	546
pH, Field	SU	6.5 - 8.5**	6.5 - 8.5 ⁽¹⁾	6.5 - 8.5 ⁽¹⁾	6.5 - 9.0	7.5	--	7.0	--	--	--	7.6
Appendix IV												
Antimony	ug/L	6	6.0	6.0	130	1	--	1	--	--	--	2
Arsenic	ug/L	10	10	10	10	9	--	< 1	--	--	--	22
Barium	ug/L	2,000	2,000	2,000	820	382	--	216	--	--	--	430
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	--	--	--	0.5
Chromium	ug/L	100	100	100	11	5	--	< 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	15	--	19	--	--	--	17
Mercury	ug/L	2	2.0	2.0	0.20#	< 0.2	--	< 0.2	--	--	--	< 0.2
Molybdenum	ug/L	NC	73	210	3,200	38	--	5	--	--	--	< 5
Radium-226	pCi/L	NC	NC	NC	NC	0.289	--	0.553	--	--	--	0.344
Radium-228	pCi/L	NC	NC	NC	NC	< 0.274	--	0.33	--	--	--	< 0.264
Radium-226/228	pCi/L	5	NC	NC	NC	0.318	--	0.883	--	--	--	0.497
Selenium	ug/L	50	50	50	5.0	2	--	68	--	--	--	308
Thallium	ug/L	2	2.0	2.0	3.7	< 2	--	< 2	--	--	--	< 2
MI Part 115 Parameters												
Iron	ug/L	300**	300⁽¹⁾	300⁽¹⁾	500,000 ⁽²⁾	929	--	56	--	--	--	< 20
Copper	ug/L	1,000**	1,000 ⁽¹⁾	1,000 ⁽¹⁾	15	4	--	2	--	--	--	1
Nickel	ug/L	NC	100	100	86	5	--	< 2	--	--	--	< 2
Silver	ug/L	100**	34	98	0.2	< 0.2	--	< 0.2	--	--	--	< 0.2
Vanadium	ug/L	NC	4.5	62	27	19	--	< 2	--	--	--	49
Zinc	ug/L	5,000**	2,400	5,000 ⁽¹⁾	190	11	--	< 10	--	--	--	< 10

Notes:

- ug/L - micrograms per liter.
- mg/L - milligrams per liter.
- SU - standard units; pH is a field parameter.
- pCi/L - picocuries per liter.
- 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 30, 2013.
- ** - 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 EGLE policy and procedure 09-014 dated June 20, 2012.
- 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.
- (1) - Criterion is the aesthetic drinking water value per footnote {E}.
- (2) - Criterion is based on the total dissolved solids GSI value per footnote {EE}.
- (3) - Not sampled; insufficient amount of groundwater present to collect sample.

Table 5
 Summary of Groundwater Sampling Results (Analytical): Fourth Quarter 2020
 JH Campbell Pond A GSI – Assessment Monitoring Program
 West Olive, Michigan

						Sample Location:	MW-13	MW-14S	PZ-24S	PZ-40S
						Sample Date:	10/19/2020 ⁽²⁾	10/20/2020	10/21/2020	10/21/2020
Constituent	Unit	EPA MCL	MI Residential*	MI Non-Residential*	MI GSI [^]	GSI				
Appendix III										
Total Dissolved Solids	mg/L	500**	500⁽¹⁾	500⁽¹⁾	500	--	NA ⁽³⁾	NA ⁽³⁾	NA ⁽³⁾	NA ⁽³⁾
Appendix IV										
Antimony	ug/L	6	6.0	6.0	130	--	< 1	< 1	< 1	< 1
Arsenic	ug/L	10	10	10	10	--	< 1	1	< 1	< 1
Barium	ug/L	2,000	2,000	2,000	820	--	8	32	19	19
Chromium	ug/L	100	100	100	11	--	< 1	1	2	2
Lithium	ug/L	NC	170	350	440	--	< 10	< 10	< 10	< 10
Molybdenum	ug/L	NC	73	210	3,200	--	< 5	< 5	< 5	< 5
Selenium	ug/L	50	50	50	5.0	--	< 1	< 1	< 1	< 1
MI Part 115 Parameters										
Vanadium	ug/L	NC	4.5	62	27	--	< 2	3	< 2	< 2

Notes:

ug/L - micrograms per liter.

mg/L - milligrams per liter.

SU - standard units; pH is a field parameter.

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

NA - not applicable.

-- - not analyzed.

* - Michigan Part 201 Generic Drinking Water Cleanup Criteria, December 30, 2013.

** - 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}.

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.

(1) - Criterion is the aesthetic drinking water value per footnote {E}.

(2) - Not sampled; insufficient amount of groundwater present to collect sample.

(3) - Total dissolved solids data for the October 2020 event contained errors introduced by the laboratory materials manufacturer and were determined to be unusable.

Table 6
 Summary of Groundwater Protection Standard Exceedances – Fourth Quarter 2020
 JH Campbell Pond A – Assessment Monitoring Program
 West Olive, Michigan

Constituent	Units	GWPS	JHC-MW-15006		JHC-MW-15007		JHC-MW-15008R		JHC-MW-15009		JHC-MW-15010		JHC-MW-15011	
			LCL	UCL	LCL	UCL	LCL	UCL	LCL	UCL	LCL	UCL	LCL	UCL
Appendix IV														
Arsenic	ug/L	10	--	--	--	--	--	--	--	--	--	--	19	38
Chromium	ug/L	100	--	--	--	--	--	--	--	--	1.0	370	--	--
Selenium	ug/L	50	--	--	--	--	1.5	58	2.6	64	6.0	180	0.37	150
Additional Michigan Part 115 Parameters														
Boron*	ug/L	500	--	--	--	--	75	430	93	560	530	2,700	120	3,200
Sulfate*	mg/L	250	27	260	--	--	--	--	--	--	--	--	--	--
TDS*	mg/L	500	200	570	--	--	25	580	--	--	--	--	220	630
pH*	SU	5.5 - 8.8	--	--	--	--	--	--	--	--	--	--	7.5	8.9
Iron*	ug/L	870	-13	930	--	--	--	--	--	--	10	2,100	--	--
Nickel*	ug/L	100	--	--	--	--	--	--	--	--	1.0	200	--	--
Vanadium*	ug/L	4.5	6.1	21	NC	NC	--	--	--	--	4.0	5.5	12	58

Notes:

ug/L - micrograms per Liter

mg/L - milligrams per Liter

SU - standard units; pH is a field parameter.

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

NC - Not Calculated; insufficient data to calculate confidence limits.

GWPS - Groundwater Protection Standard as established in TRC's Technical Memoranda dated October 15, 2018 and December 23, 2019.

UCL - Upper Confidence Limit ($\alpha = 0.01$) of the downgradient data set.

LCL - Lower Confidence Limit ($\alpha = 0.01$) of the downgradient data set.

*Statistically evaluated per Michigan Part 115.

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

Table 7
 Summary of Groundwater Exceedances
 Fourth Quarter 2020
 JH Campbell Plant Pond A, West Olive, Michigan

MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY
 SUMMARY OF STATISTICAL EXCEEDANCES

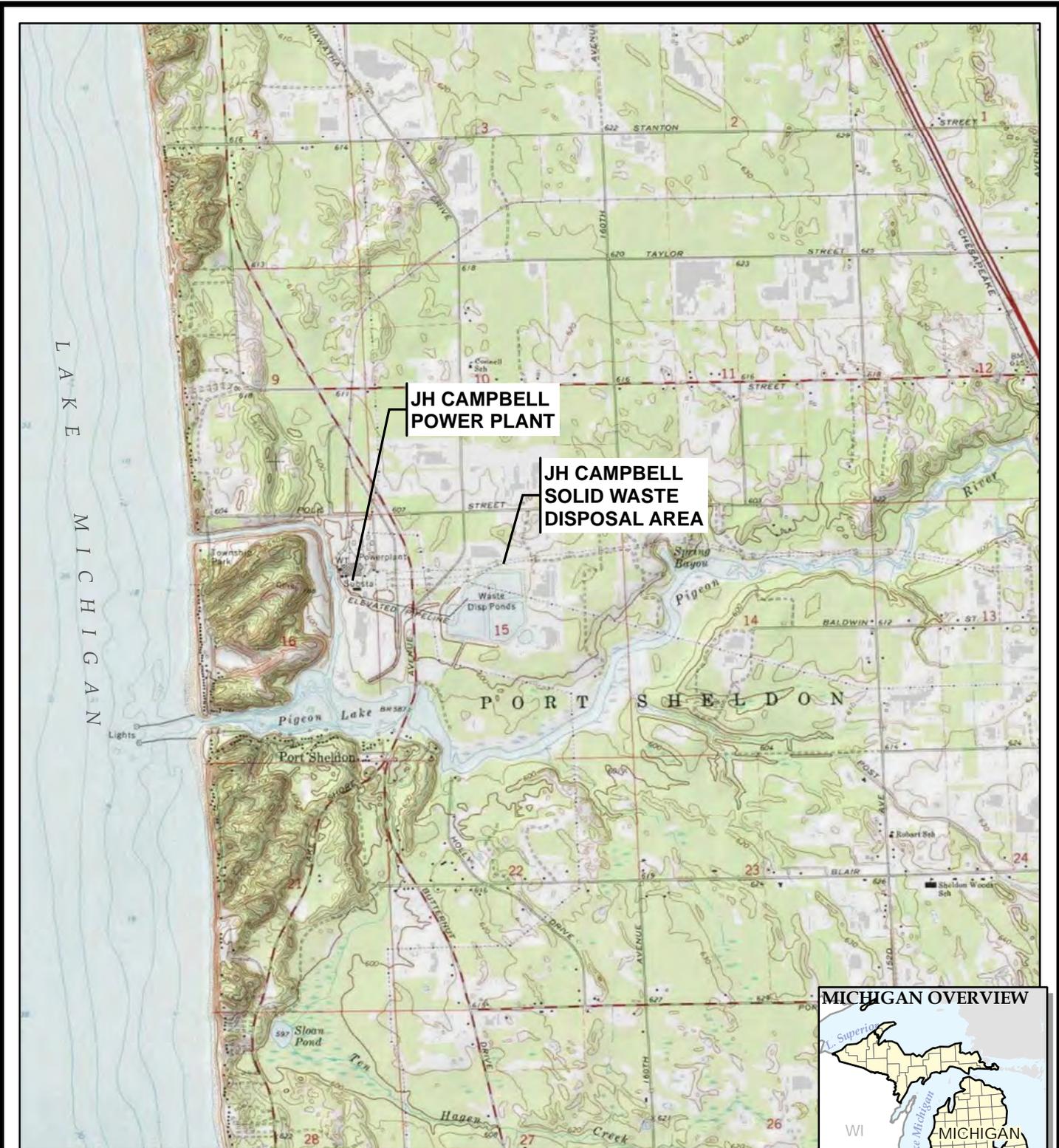
Data is in (X) ug/L or
 () mg/L
 unless otherwise stated

Facility: JH Campbell – WDS# 395496

Well #	Location	Parameter	Part 201 GRCC	Statistical Limit (or 'CC' for Control Charts)	4 Qtr. 2020 (bold >201)	3 Qtr. 2020 (bold >201)	2 Qtr. 2020 (bold >201)	1 Qtr. 2020 (bold >201)
JHC-MW-15010	Downgradient	Boron	500	LCL	NS	2,130	2,350⁽¹⁾	2,390⁽¹⁾
JHC-MW-15011	Downgradient	Arsenic	10	LCL	22	22	25	31
JHC-MW-15006	Downgradient	Vanadium	4.5	LCL	19	15⁽¹⁾	10⁽¹⁾	16⁽¹⁾
JHC-MW-15011	Downgradient	Vanadium	4.5	LCL	49	30⁽¹⁾	40⁽¹⁾	42⁽¹⁾

Notes:
 Table summarizes statistically significant Groundwater Protection Standards (GWPSs) exceedances as determined using confidence intervals.
 LCL - Lower confidence limit
 NS - Not sampled; insufficient amount of groundwater present to collect sample.
 (1) - Exceeded Part 201 Generic Residential Cleanup Criteria (GRCC) but did not result in a statistically significant GWPS exceedance.

Figures



BASE MAP FROM USGS 7.5 MINUTE TOPOGRAPHIC QUADRANGLE SERIES.

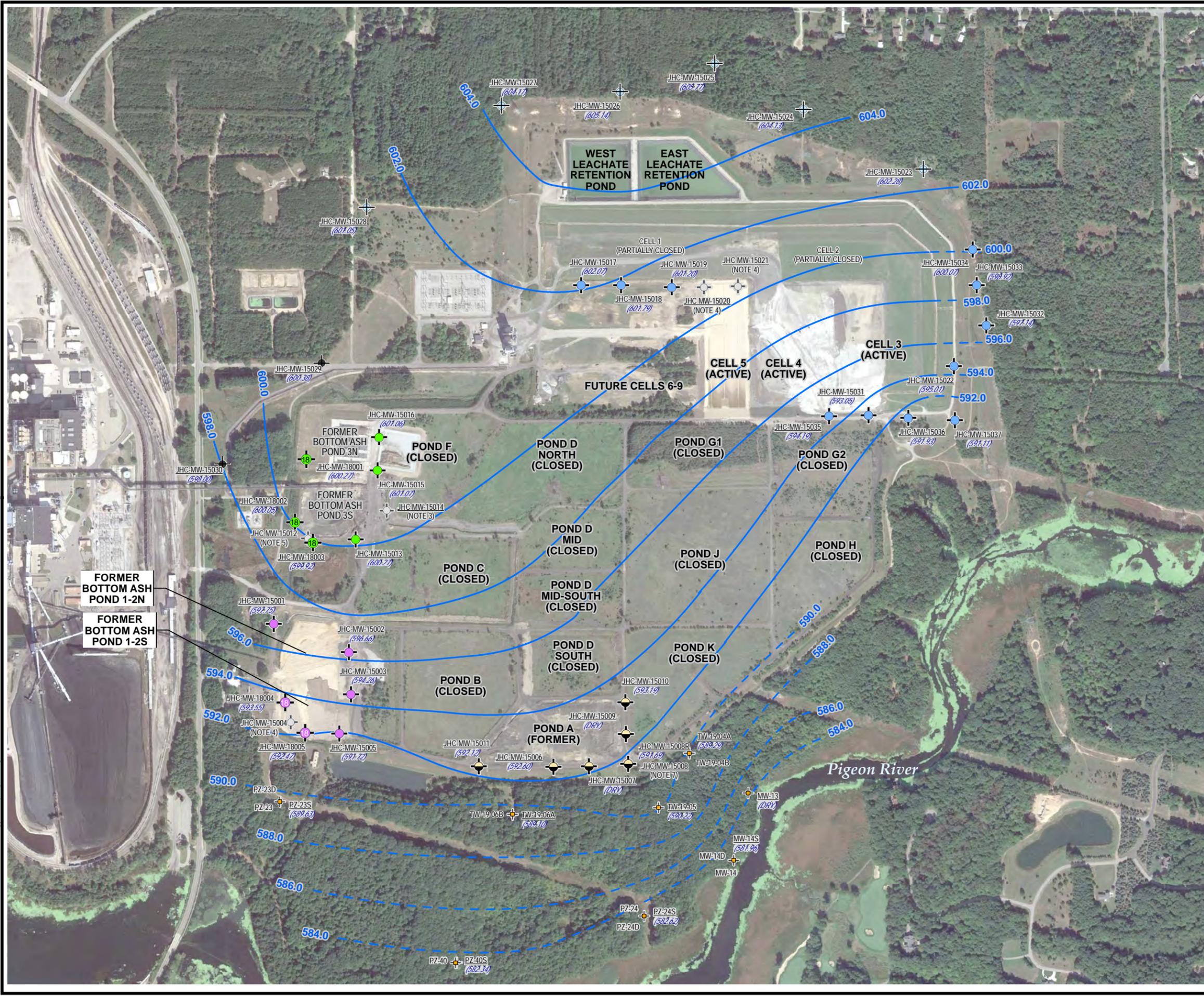



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PROJECT:	CONSUMERS ENERGY COMPANY JH CAMPBELL POWER PLANT WEST OLIVE, MICHIGAN
TITLE:	SITE LOCATION MAP

DRAWN BY:	S. MAJOR
CHECKED BY:	B. YELEN
APPROVED BY:	S. HOLMSTROM
DATE:	JANUARY 2021
PROJ. NO.:	367390
FILE:	367390-001-007.mxd

FIGURE 1



LEGEND

- BACKGROUND MONITORING WELL
- BOTTOM ASH POND 1/2 N/S MONITORING WELL
- BOTTOM ASH POND 3 N/S MONITORING WELL
- DOWNGRAIDENT LANDFILL MONITORING WELL
- DOWNGRAIDENT POND A MONITORING WELL
- MONITORING WELL (STATIC WATER LEVEL ONLY)
- DECOMMISSIONED MONITORING WELL
- NEW DOWNGRAIDENT BOTTOM ASH POND 1/2 N/S MONITORING WELL (2018)
- NEW DOWNGRAIDENT BOTTOM ASH POND 3 N/S MONITORING WELL (2018)
- NATURE AND EXTENT WELL
- GROUNDWATER ELEVATION CONTOUR (2' INTERVAL, DASHED WHERE INFERRED)
- (600.97) GROUNDWATER ELEVATION (FEET) SHALLOW WELLS
- (NM) NOT MEASURED

NOTES

1. BASE MAP IMAGERY FROM GOOGLE EARTH PRO, 2018.
2. WELL LOCATIONS BASED ON SURVEY DATA THROUGH 12/07/2018.
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. STATIC WATER ELEVATIONS IN NORTH AMERICAN VERTICAL DATUM 1988, NAVD 88.

1" = 700'
1:8,400

PROJECT:		CONSUMERS ENERGY COMPANY JH CAMPBELL POWER PLANT WEST OLIVE, MICHIGAN	
TITLE:		GROUNDWATER CONTOUR MAP OCTOBER 2020	
DRAWN BY:	S. MAJOR	PROJ NO.:	367390.0000
CHECKED BY:	B. YELEN	FIGURE 3	
APPROVED BY:	S. HOLMSTROM		
DATE:	JANUARY 2021		

FILE NO.: 367390-001-006.mxd

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Appendix A

Data Quality Review

Laboratory Data Quality Review Groundwater Monitoring Event October 2020 CEC JH Campbell Background Wells

Groundwater samples were collected by Consumers Energy (CE) Laboratory Services for the October 2020 sampling event. Samples were analyzed for total metals, anions, and total dissolved solids (TDS) by CE Laboratory Services in Jackson, Michigan. The radium analyses were subcontracted to Eurofins-TestAmerica in St. Louis, Missouri (Eurofins TA – St. Louis). The laboratory analytical results were reported in laboratory sample delivery groups 20-1192 and 160-40223-1.

During the October 2020 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
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 USEPA National Functional Guidelines for Inorganic Superfund Methods Data Review (USEPA, 2017) and 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.

It should be noted that results for method blanks and laboratory control samples were not provided for review by the laboratory. 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.

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 iron, copper, nickel, silver, vanadium, and zinc 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

- A method blank was analyzed with each analytical batch for radium. Radium 228 was detected in MB 160-490784/23-A at 0.5069 +/- 0.266 pCi/L. There was no impact on data usability since radium 228 was not detected in the associated samples.
- One equipment blank (EB-01) and one field blank (FB-01) were collected. Target analytes were not detected in these blank samples.
- An LCS and LCSD were analyzed with each analytical batch for radium; the following issues were noted.

- Radium 226 recovered above the acceptance limits (75-125%) in LCS 160-490013/1-A (132%). No data are affected as no associated samples had positive detections for radium 226.
- Radium 228 recovered above the acceptance limits (75-125%) in LCSD 160-490784/1-A (132%). Further, the replicate error ratio was above the acceptance limit (1.0) for LCS 160-490784/1-A and LCSD 160-490784/2-A (1.02) for radium 228. No data are affected as no associated samples had positive detections for radium 228.
- MS and MSD analyses were performed on sample JHC-MW-15025 for mercury, 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-15028. All criteria were met.
- The barium carrier in samples JHC-MW-15023 (146%), JHC-MW-15025 (182%), JHC-MW-15026 (154%), and JHC-MW-15028 (140%) recovered above the acceptance limits (40-110%) for the radium 226 and 228 analyses. The carrier results were truncated by the laboratory to 100% to minimize potential high bias. The positive and nondetect results of radium 226 and 228 for these samples are potentially uncertain as summarized in the attached table, Attachment A.
- The barium carrier in sample JHC-MW-15024 (124%) recovered above the acceptance limits (40-110%) for the radium 226 analysis. The carrier result was truncated by the laboratory to 100% to minimize potential high bias. The nondetect result for radium 226 in this sample is uncertain as summarized in the attached table, Attachment A.
- CE Laboratory identified that the pre-determined weights of the bags used in the TDS analyses were inaccurate and this issue could not be resolved to determine the potential bias on the individual sample results. Therefore, the positive and nondetect results for TDS in all samples are potentially uncertain as summarized in the attached table, Attachment A. However, the results do not vary significantly from historical data for each monitoring well, therefore, the TDS data are considered usable for purposes of this monitoring program.

Attachment A

Summary of Data Non-Conformances for Landfill Groundwater Analytical Data
 JH Campbell Background Wells- CCR Monitoring Program
 West Olive, Michigan

Samples	Collection Date	Analyte	Non-Conformance/Issue
JHC-MW-15023	10/20/2020	TDS	Pre-weighed sample bag weights were potentially inaccurate. Indicates uncertainty in results.
JHC-MW-15024	10/20/2020		
JHC-MW-15025	10/20/2020		
JHC-MW-15026	10/20/2020		
JHC-MW-15027	10/20/2020		
JHC-MW-15028	10/20/2020		
DUP-01	10/20/2020		
EB-01	10/20/2020		
JHC-MW-15024	10/20/2020	Radium 226	Barium carrier recovery above acceptance criteria (40-110%); carrier results truncated by laboratory to 100%. Indicates potential uncertainty in results.
JHC-MW-15023	10/20/2020	Radium 226, Radium 228	Barium carrier recovery above acceptance criteria (40-110%); carrier results truncated by laboratory to 100%. Indicates potential uncertainty in results.
JHC-MW-15025	10/20/2020		
JHC-MW-15026	10/20/2020		
JHC-MW-15028	10/20/2020		

Laboratory Data Quality Review Groundwater Monitoring Event October 2020 CEC JH Campbell Pond A Wells

Groundwater samples were collected by Consumers Energy (CE) Laboratory Services for the October 2020 sampling event. Samples were analyzed for total metals, anions, and total dissolved solids (TDS) by CE Laboratory Services in Jackson, Michigan. The radium analyses were subcontracted to Eurofins-TestAmerica in St. Louis, Missouri (Eurofins TA – St. Louis). The laboratory analytical results were reported in laboratory sample delivery groups 20-1195R and 160-40221-1.

During the October 2020 sampling event, a groundwater sample was collected from each of the following wells:

- JHC-MW-15006
- JHC-MW-15008R
- JHC-MW-15011

Wells JHC-MW-15007, JHC-MW-15009, and JHC-MW-15010 were dry so a sample was not collected from these wells during this event.

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, SW-846 7470A
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 USEPA National Functional Guidelines for Inorganic Superfund Methods Data Review (USEPA, 2017) and 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.

It should be noted that results for method blanks and LCSs were not provided for review by the laboratory. 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.

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 iron, copper, nickel, silver, vanadium, and zinc 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

- A method blank was analyzed with each analytical batch for radium. Radium was not detected in the method blank samples.
- One equipment blank (EB-04) and one field blank (FB-04) were collected. Target analytes were not detected in these blank samples.

- An LCS and LCSD were analyzed with each analytical batch for radium. Radium 226 recovered above the acceptance limits (75-125%) in LCS 160-490013/1-A (132%). The positive detections of radium 226 in samples JHC-MW-15006, JHC-MW-15008R, and JHC-MW-15011 are potentially biased high as summarized in the attached table, Attachment A.
- MS and MSD analyses were not performed on a sample from this data set.
- The field duplicate pair samples were DUP-04/JHC-MW-15006. The relative percent differences (RPDs) for the following analytes were outside of the acceptance criteria:
 - The RPD for arsenic (40%) exceeded the acceptance limit. Potential uncertainty exists for positive results for arsenic in groundwater samples in this data set as noted in the attached table, Attachment A.
 - The RPD for barium (65.3%) exceeded the acceptance limit. Potential uncertainty exists for positive results for barium in all groundwater samples in this data set as noted in the attached table, Attachment A.
 - The RPD for chromium (133%) exceeded the acceptance limit. Potential uncertainty exists for positive results for chromium in groundwater samples in this data set as noted in the attached table, Attachment A.
 - The RPD for iron (125%) exceeded the acceptance limit. Potential uncertainty exists for positive results for iron in groundwater samples in this data set as noted in the attached table, Attachment A.
 - The RPD for nickel (5 ug/L; <1 ug/L) was not calculable but the variability exceeded the acceptance limit. Potential uncertainty exists for the positive and non-detect results for nickel in groundwater samples in this data set as noted in the attached table, Attachment A.
 - The RPD for selenium (66.7%) exceeded the acceptance limit. Potential uncertainty exists for positive results for selenium in all groundwater samples in this data set as noted in the attached table, Attachment A.
 - The RPD for vanadium (71.4%) exceeded the acceptance limit. Potential uncertainty exists for positive results for vanadium in groundwater samples in this data set as noted in the attached table, Attachment A.
 - The RPD for zinc (70.6%) exceeded the acceptance limit. Potential uncertainty exists for positive results for zinc in groundwater samples in this data set as noted in the attached table, Attachment A.
- The barium carrier in samples JHC-MW-15006 (148%), JHC-MW-15008R (121%), JHC-MW-15011 (132%), FB-04 (169%), and EB-4 (132%) above the acceptance limits (40-110%) for the radium 226 and 228 analyses. The carrier results were truncated by Eurofins-TA St. Louis to 100% to minimize potential high bias. The positive and nondetect results of radium 226 and 228 for these samples are potentially uncertain as summarized in the attached table, Attachment A.
- CE Laboratory identified that the pre-determined weights of the bags used in the TDS analyses were inaccurate and this issue could not be resolved to determine the potential bias on the individual sample results. Therefore, the positive and nondetect results for TDS in all samples are potentially uncertain as summarized in the attached table, Attachment A. However, the results do not vary significantly from historical data for each monitoring well, therefore, the TDS data are considered usable for purposes of this monitoring program.

Attachment A

Summary of Data Non-Conformances for Landfill Groundwater Analytical Data
 JH Campbell Pond A – CCR Monitoring Program
 West Olive, Michigan

Samples	Collection Date	Analyte	Non-Conformance/Issue
JHC-MW-15006	10/22/2020	TDS	Pre-weighed sample bag weights were potentially inaccurate. Indicates uncertainty in results.
JHC-MW-15008R	10/22/2020		
JHC-MW-15011	10/22/2020		
DUP-04	10/22/2020		
EB-04	10/22/2020		
FB-04	10/22/2020		
JHC-MW-15006	10/22/2020	Barium, Selenium, Nickel	Field duplicate relative percent difference (RPD) exceeds acceptance criteria (<30%); indicates potential uncertainty in results.
JHC-MW-15008R	10/22/2020		
JHC-MW-15011	10/22/2020		
DUP-04	10/22/2020		
JHC-MW-15006	10/22/2020	Chromium, Zinc	Field duplicate RPD exceeds acceptance criteria (<30%); indicates potential uncertainty in results.
DUP-04	10/22/2020		
JHC-MW-15006	10/22/2020	Arsenic, Vanadium	Field duplicate RPD exceeds acceptance criteria (<30%); indicates potential uncertainty in results.
JHC-MW-15011	10/22/2020		
DUP-04	10/22/2020		
JHC-MW-15006	10/22/2020	Iron	Field duplicate RPD exceeds acceptance criteria (<30%); indicates potential uncertainty in results.
JHC-MW-15008R	10/22/2020		
DUP-04	10/22/2020		
JHC-MW-15006	10/22/2020	Radium 226	Laboratory Control Sample (LCS) percent recovery (%R) above acceptance criteria (75-125%); indicates potential high bias in results.
JHC-MW-15008R	10/22/2020		
JHC-MW-15011	10/22/2020		
JHC-MW-15006	10/22/2020	Radium 226, Radium 228	Barium carrier recovery above acceptance criteria (40-110%); carrier results truncated to 100% by laboratory. Indicates potential uncertainty in results.
JHC-MW-15008R	10/22/2020		
JHC-MW-15011	10/22/2020		
EB-04	10/22/2020		
FB-04	10/22/2020		

Appendix B

October 2020 Assessment Monitoring Statistical Evaluation

Technical Memorandum

Date: January 27, 2021

To: Bethany Swanberg, Consumers Energy

From: Sarah Holmstrom, TRC
Kristin Lowery, TRC

Project No.: 367390.0000.0000 Phase 1 Task 4

Subject: Statistical Evaluation of October 2020 Assessment Monitoring Sampling Event, JH Campbell Pond A, Consumers Energy, West Olive, Michigan

Consumers Energy is conducting quarterly groundwater monitoring at Pond A in accordance with the Pond A Hydrogeological Monitoring Plan (HMP) and Assessment Monitoring Plan (AMP) and semiannual monitoring in accordance with the CCR Rule per the JH Campbell Monitoring Program Sample Analysis Plan (SAP) (ARCADIS, May 2016). The fourth quarter 2020 monitoring event was conducted on October 19 through 23, 2020. In accordance with the Pond A AMP, the assessment monitoring data must be compared to groundwater protection standards (GWPSs) to determine whether or not Appendix III and Appendix IV constituents, and additional Michigan Part 115 (as amended by PA 640) Section 11511a(3) and Section 11519b(2) constituents, are detected at statistically significant levels above the GWPSs. GWPSs were established as follows:

- Appendix IV GWPSs were established in accordance with §257.95(h), as detailed in the October 15, 2018, Groundwater Protection Standards technical memorandum, included as Appendix C of the 2018 Annual Groundwater Monitoring Report (TRC, January 2019).
- Appendix III GWPSs were established in accordance with §257.95(h) and the HMP, as detailed in the December 23, 2019, Groundwater Protection technical memorandum, included as Appendix G of the 2019 Annual Groundwater Monitoring Report (TRC, January 2020).
- GWPSs were established for additional Section 11511a(3) constituent (iron) and Section 11519b(2) constituents (copper, nickel, silver, vanadium, and zinc) in accordance with §257.95(h) and the HMP, as detailed in the 2020 PA 640 Constituent Groundwater Protection Standards technical memorandum that was included in the Third Quarter 2020 Hydrogeological Monitoring Report (TRC, October 2020).

The following narrative describes the methods that were employed for the comparisons to the GWPSs. The results obtained and the Sanitas™ output files are included as an attachment.

The statistical evaluation of the fourth quarter 2020 event data indicates that the following constituents are present at statistically significant levels exceeding the GWPS in downgradient monitoring wells at the JHC Pond A CCR Unit:

Technical Memorandum

Constituent	GWPS	# Downgradient Wells Observed
Arsenic	10 ug/L	1 of 6
Boron	500 ug/L	1 of 6
Vanadium	4.5 ug/L	2 of 6

Assessment Monitoring Statistical Evaluation

The downgradient compliance well network at the JHC Pond A consists of six wells (JHC-MW-15006 through JHC-MW-15011) located south and east of Pond A. During the fourth quarter 2020 sampling event, JHC-MW-15007, JHC-MW-15009, and JHC-MMW-15010 had an insufficient amount of groundwater present for samples to be collected.

Following the fourth quarter 2020 sampling event, compliance well data for JHC Pond A were evaluated in accordance with the Groundwater Statistical Evaluation Plan (Stats Plan) (TRC, October 2017) and the Pond A HMP and AMP. The assessment monitoring program evaluates concentrations of CCR constituents present in the uppermost aquifer relative to acceptable levels (i.e., GWPSs). To evaluate whether or not a new GWPS exceedance is statistically significant, the difference in concentration observed at the downgradient 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 Guidance¹, the preferred method for comparisons to a fixed standard are confidence limits. Based on the number of historical observations in the representative sample population, the population mean, the population standard deviation, and a selected confidence level (i.e., 99 percent), upper and lower confidence limits are calculated. The actual mean concentration of the population, with 99 percent confidence, will fall between and lower and upper confidence limits.

For constituents at monitoring wells that have no previously identified statistically significant GWPS exceedances, 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 GWPS². 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 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 constituent, the concentrations from each well were first compared directly to the

¹ USEPA. 2009. *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, Unified Guidance*. Office of Conservation and Recovery. EPA 530/R-09-007

² For pH, an exceedance occurs when the lower confidence level exceeds the upper GWPS or the upper confidence level is below the lower GWPS.

Technical Memorandum

GWPS, as shown on Table B1. Constituent-well combinations that included a direct exceedance of the GWPS within the past eight monitoring events for Appendix III and Appendix IV (June 2018 to October 2020 for JHC-MW-15006 and JHC-MW-15011, August 2017 to October 2020 for JHC-MW-15007 and JHC-MW-15009, and September 2017 to October 2020 for JHC-MW-15008/R and JHC-MW-15010) and the past five events for the additional Section 11511a(3) constituents (iron) and Section 11519b(2) (copper, nickel, silver, vanadium, and zinc) (October 2019 through October 2020) were retained for further analysis (Attachment 1). Direct comparison GWPS exceedances include the following constituent well combinations:

- Sulfate, total dissolved solids (TDS), iron, and vanadium in JHC-MW-15006;
- Vanadium in JHC-MW-15007³;
- Boron, TDS, and selenium in JHC-MW-15008/R;
- Boron and selenium in JHC-MW-15009;
- Boron, chromium, selenium, iron, nickel, and vanadium in JHC-MW-15010; and
- Boron, TDS, pH, arsenic, selenium, and vanadium in JHC-MW-15011.

Groundwater data were then evaluated utilizing Sanitas™ statistical software. Sanitas™ is a software tool that is commercially available for performing statistical evaluations 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 and non-parametric confidence intervals were calculated, as appropriate, for each of the constituents using a 99 percent confidence level for each individual statistical test, i.e., a significance level (α) of 0.01. The following narrative describes the methods employed, the results obtained and 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.

³ JHC-MW-15007 was not sampled in October 2019 and October 2020 due to an insufficient quantity of groundwater present. Therefore, only three sampling events have been completed for vanadium at JHC-MW-15007 and there is insufficient data for statistical analysis. Per the AMP, a confidence interval will be calculated following the collection of a minimum of four data points.

Technical Memorandum

Initially, results for the past eight events were observed visually for potential trends and outliers (time-series plots in Attachment 1). Potential outliers were noted for chromium, iron, and nickel in JHC-MW-15010 in October 2019. Potential increasing trends were noted for boron and vanadium in JHC-MW-15011 (trend tests in Attachment 1). Groundwater conditions are re-equilibrating following capping activities at JHC Pond A that were completed in Summer 2019. Because hydrogeologic conditions are in the process of stabilizing, temporary trending and sporadic outlier data are not unexpected.

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 an appropriate density of data as recommended per the Unified Guidance yet are collected recently enough to provide an indication of current condition. For the Section 11511a(3) constituents (iron) and Section 11519b(2) (copper, nickel, silver, vanadium, and zinc), the most recent five sampling events were used to calculate confidence intervals. These data sets will increase each event until there are a total of eight data points, which will then become a rolling window of the most recent eight data points moving forward, for confidence interval analysis. The tests were run with a per-well significance of $\alpha = 0.01$. The software outputs are included in Attachment 1 along with data reports showing the values used for the evaluation. The percentage of non-detect observations are also included in Attachment 1. Non-detect data were 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. The data distributions are as follows:

Distribution	Constituent-Well Combinations
Normal	Boron in JHC-MW-15008/R and JHC-MW-15011 TDS in JHC-MW-15006 and JHC-MW-15011 pH in JHC-MW-15011 Arsenic in JHC-MW-15011 Selenium in JHC-MW-15010 Vanadium in JHC-MW-15006 and JHC-MW-15011
Normalized by square root transformation	Boron in JHC-MW-15009 Selenium in JHC-MW-15011 Iron in JHC-MW-15006
Normalized by cube root transformation	Selenium in JHC-MW-15008/R
Normalize by Kaplan-Meier square root transformation	Selenium in JHC-MW-15009

Technical Memorandum

Distribution	Constituent-Well Combinations
Normalized by cubic transformation	Boron in JHC-MW-15010
Non-Parametric (not able to be normalized)	Sulfate in JHC-MW-15006 TDS in JHC-MW-15008/R Chromium in JHC-MW-15010 Iron in JHC-MW-15010 Nickel in JHC-MW-15010 Vanadium in JHC-MW-15010

Arsenic was identified at downgradient monitoring well JHC-MW-15011 at statistically significant levels exceeding the GWPS during the initial assessment monitoring event conducted in June 2018. As shown in Table B1 and Attachment 1, arsenic concentrations in this well have begun to decline in 2020 but remain above the GWPS. Boron at JHC-MW-15010 was identified at statistically significant levels exceeding the GWPS in July 2020. Boron concentrations at monitoring well JHC-MW-15010 showed an increase in 2019 and have remained generally stable in 2019 and 2020. Vanadium at JHC-MW-15006 and JHC-MW-15011 were identified at statistically significant levels exceeding the GWPS in October 2020. Vanadium concentrations at these monitoring wells have consistently been above the GWPS since monitoring for vanadium under the Pond A HMP and AMP began in October 2019. As discussed above, completion of JHC Pond A capping activities occurred in Summer 2019 and groundwater conditions are re-equilibrating. Consumers Energy will continue to monitor changes in groundwater chemistry and the assessment of corrective measures per the Pond A HMP and AMP and §257.95(g).

Attachments

- Table B1 Comparison of Groundwater Sampling Results to Groundwater Protection Standards for Statistical Evaluation

- Attachment 1 Sanitas™ Output

Table

Table B1
 Comparison of Groundwater Sampling Results to Groundwater Protection Standards for Statistical Evaluation
 JH Campbell Pond A – HMP/AMP
 West Olive, Michigan

Sample Location:									JHC-MW-15006										
Sample Date:									6/20/2018	6/20/2018	11/15/2018	4/24/2019	10/10/2019	2/12/2020	4/14/2020	7/16/2020	10/22/2020	10/22/2020	
Constituent	Unit	EPA MCL	EPA RSL	MI Residential*	MI Non-Residential*	MI GSI^	UTL	GWPS	Downgradient										
										Field Dup									Field Dup
Appendix III																			
Boron	ug/L	NC	NA	500	500	7,200	54	500	144	147	203	240	230	247	284	242	272	331	
Calcium	mg/L	NC	NA	NC	NC	500	40	500	38.5	38.6	26.8	41	35	101	102	91.4	87.2	84.3	
Chloride	mg/L	250**	NA	250 ⁽¹⁾	250 ⁽¹⁾	500	70	250	17.2	17.2	24.8	21	22	21.0	24.9	27.7	22	22.2	
Fluoride	ug/L	4,000	NA	NC	NC	NC	1,000	4,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	
Sulfate	mg/L	250**	NA	250 ⁽¹⁾	250 ⁽¹⁾	500	13	250	27.5	27.5	27.0	75	55	217	260	195	253	251	
Total Dissolved Solids	mg/L	500**	NA	500 ⁽¹⁾	500 ⁽¹⁾	500	240	500	376	268	140	240	190	542	562	521	515	511	
pH, Field	SU	6.5 - 8.5**	NA	6.5 - 8.5 ⁽¹⁾	6.5 - 8.5 ⁽¹⁾	6.5 - 9.0	5.5 - 8.8	5.5 - 8.8	7.4	--	7.8	7.6	7.8	7.6	7.2	7.4	7.5	--	
Appendix IV																			
Antimony	ug/L	6	NA	6.0	6.0	130	2	6	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	1	< 1	1	< 1	
Arsenic	ug/L	10	NA	10	10	10	1	10	4.3	4.7	4.7	5.1	4.3	6	5	5	9	6	
Barium	ug/L	2,000	NA	2,000	2,000	820	35	2,000	141	146	144	230	180	326	353	291	382	194	
Beryllium	ug/L	4	NA	4.0	4.0	18	1	4	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1	< 1	< 1	
Cadmium	ug/L	5	NA	5.0	5.0	3.5	0.2	5	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	
Chromium	ug/L	100	NA	100	100	11	2	100	1.5	1.8	2.3	4.1	< 1.0	2	1	18	5	1	
Cobalt	ug/L	NC	6	40	100	100	15	15	< 15.0	< 15.0	< 6.0	< 6.0	< 6.0	< 6	< 15	< 6	< 6	< 6	
Fluoride	ug/L	4,000	NA	NC	NC	NC	1,000	4,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	
Lead	ug/L	NC	15	4.0	4.0	39	1	15	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1	< 1	< 1	
Lithium	ug/L	NC	40	170	350	440	10	40	12	12	13	< 10	< 10	13	13	13	15	14	
Mercury	ug/L	2	NA	2.0	2.0	0.20#	0.2	2	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	
Molybdenum	ug/L	NC	100	73	210	3,200	5	100	5.4	5.5	12.2	10	9.1	13	16	22	38	37	
Radium-226	pCi/L	NC	NA	NC	NC	NC	NA	NA	< 0.540	< 0.483	< 0.740	0.234	0.310	--	0.426	--	0.289	< 0.345	
Radium-228	pCi/L	NC	NA	NC	NC	NC	NA	NA	< 0.963	< 0.944	< 0.588	< 0.343	< 0.524	--	0.518	--	< 0.274	< 0.399	
Radium-226/228	pCi/L	5	NA	NC	NC	NC	1.93	5	< 1.50	< 1.43	< 1.33	0.488	< 0.524	--	0.944	--	0.318	0.453	
Selenium	ug/L	50	NA	50	50	5.0	5	50	< 1.0	< 1.0	< 1.0	< 1.0	1.3	8	9	5	2	1	
Thallium	ug/L	2	NA	2.0	2.0	3.7	2	2	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2	< 2	< 2	< 2	< 2	
MI Part 115 Parameters																			
Iron	ug/L	300**	NA	300 ⁽¹⁾	300 ⁽¹⁾	500,000	870	870	--	--	--	--	43	189	26	128	929	213	
Copper	ug/L	1,000**	NA	1,000 ⁽¹⁾	1,000 ⁽¹⁾	15	2.1	1,000	--	--	--	--	< 1.0	2	1	11	4	4	
Nickel	ug/L	NC	NA	100	100	86	2	100	--	--	--	--	< 2.0	14	1	13	5	< 2	
Silver	ug/L	100**	NA	34	98	0.20	0.2	34	--	--	--	--	< 0.20	< 0.2	< 0.4	< 0.2	< 0.2	< 0.2	
Vanadium	ug/L	NC	NA	4.5	62	27	2	4.5	--	--	--	--	8	16	10	15	19	9	
Zinc	ug/L	5,000**	NA	2,400	5,000 ⁽¹⁾	190	18	2,400	--	--	--	--	< 10	< 10	< 10	< 30	11	23	

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.
 NC - no criteria.
 -- - not analyzed.
 MCL - Maximum Contaminant Level, EPA Drinking Water Standards and Health Advisories, April 2012.
 RSL - Regional Screening Level from 83 FR 36435.
 UTL - Upper Tolerance Limit (95%) of the background data set.
 GWPS - Groundwater Protection Standard. Appendix IV GWPS is the higher of the MCL/RSL and UTL as established in TRC's Technical Memorandum dated October 15, 2018. Appendix III GWPS is the most restrictive of the MCL/Part 201 criteria, or the UTL if the UTL exceeds the applicable criteria as established in TRC's Technical Memorandum dated December 23, 2019.
 * - Michigan Part 201 Generic Drinking Water Cleanup Criteria, December 30, 2013.
 ** - 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 EGLE policy and procedure 09-014 dated June 20, 2012.
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.
 (1) Criterion is the aesthetic drinking water value per footnote (E).
 (2) pH value potentially biased high due to groundwater quality meter malfunction.
 (3) Not sampled; insufficient amount of groundwater present to collect sample.
 (4) JHC-MW-15008 was decommissioned on June 24, 2019. Replacement well JHC-MW-15008R was installed on June 25, 2019.

Table B1
 Comparison of Groundwater Sampling Results to Groundwater Protection Standards for Statistical Evaluation
 JH Campbell Pond A – HMP/AMP
 West Olive, Michigan

Sample Location:									JHC-MW-15007										
Sample Date:									8/15/2017	9/26/2017	4/26/2018	6/20/2018	11/15/2018	4/24/2019	10/9/2019 ⁽³⁾	2/12/2020	4/14/2020	7/16/2020	10/22/2020 ⁽³⁾
Constituent	Unit	EPA MCL	EPA RSL	MI Residential*	MI Non-Residential*	MI GSI [^]	UTL	GWPS	Downgradient										
Appendix III																			
Boron	ug/L	NC	NA	500	500	7,200	54	500	141	98	--	157	142	190	--	147	242	162	--
Calcium	mg/L	NC	NA	NC	NC	500	40	500	32.1	32.2	--	38.7	42.6	79	--	55.2	62.1	52.8	--
Chloride	mg/L	250**	NA	250 ⁽¹⁾	250 ⁽¹⁾	500	70	250	17.5	17.3	--	17.5	20.6	23	--	9.10	14.1	9.16	--
Fluoride	ug/L	4,000	NA	NC	NC	NC	1,000	4,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	--	< 1,000	< 1,000	< 1,000	--
Sulfate	mg/L	250**	NA	250 ⁽¹⁾	250 ⁽¹⁾	500	13	250	31.6	32.3	--	26.2	19.2	54	--	31.9	83	68.3	--
Total Dissolved Solids	mg/L	500**	NA	500 ⁽¹⁾	500 ⁽¹⁾	500	240	500	170	188	--	298	166	360	--	312	336	357	--
pH, Field	SU	6.5 - 8.5**	NA	6.5 - 8.5 ⁽¹⁾	6.5 - 8.5 ⁽¹⁾	6.5 - 9.0	5.5 - 8.8	5.5 - 8.8	7.4	7.3	8.4 ⁽²⁾	7.4	7.6	7.4	--	7.4	7.0	7.1	--
Appendix IV																			
Antimony	ug/L	6	NA	6.0	6.0	130	2	6	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	--	< 1	< 1	< 1	--
Arsenic	ug/L	10	NA	10	10	10	1	10	4.0	--	3.3	2.9	4.0	4.0	--	3	3	3	--
Barium	ug/L	2,000	NA	2,000	2,000	820	35	2,000	130	--	121	115	177	320	--	231	266	248	--
Beryllium	ug/L	4	NA	4.0	4.0	18	1	4	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	--	< 1	< 1	< 1	--
Cadmium	ug/L	5	NA	5.0	5.0	3.5	0.2	5	< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20	--	< 0.2	< 0.2	< 0.2	--
Chromium	ug/L	100	NA	100	100	11	2	100	1.1	--	< 1.0	1.2	31.3	35	--	3	2	2	--
Cobalt	ug/L	NC	6	40	100	100	15	15	< 15.0	--	< 15.0	< 15.0	< 6.0	< 6.0	--	< 6	< 15	< 6	--
Fluoride	ug/L	4,000	NA	NC	NC	NC	1,000	4,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	--	< 1,000	< 1,000	< 1,000	--
Lead	ug/L	NC	15	4.0	4.0	39	1	15	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	--	< 1	< 1	< 1	--
Lithium	ug/L	NC	40	170	350	440	10	40	16	--	11	15	16	12	--	15	14	13	--
Mercury	ug/L	2	NA	2.0	2.0	0.20#	0.2	2	< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20	--	< 0.2	< 0.2	< 0.2	--
Molybdenum	ug/L	NC	100	73	210	3,200	5	100	6.1	--	< 5.0	< 5.0	7.6	7.2	--	< 5	< 5	< 5	--
Radium-226	pCi/L	NC	NA	NC	NC	NC	NA	NA	< 0.430	--	< 1.03	< 0.736	0.864	0.217	--	--	0.197	--	--
Radium-228	pCi/L	NC	NA	NC	NC	NC	NA	NA	< 0.904	--	< 1.02	< 1.12	< 0.688	0.392	--	--	< 0.456	--	--
Radium-226/228	pCi/L	5	NA	NC	NC	NC	1.93	5	< 1.33	--	< 2.05	< 1.86	1.40	0.609	--	--	< 0.456	--	--
Selenium	ug/L	50	NA	50	50	5.0	5	50	1.1	--	< 1.0	1.3	< 1.0	4.1	--	23	22	22	--
Thallium	ug/L	2	NA	2.0	2.0	3.7	2	2	< 2.0	--	< 2.0	< 2.0	< 2.0	< 2.0	--	< 2	< 2	< 2	--
MI Part 115 Parameters																			
Iron	ug/L	300**	NA	300 ⁽¹⁾	300 ⁽¹⁾	500,000	870	870	--	--	--	--	--	--	--	71	< 20	< 20	--
Copper	ug/L	1,000**	NA	1,000 ⁽¹⁾	1,000 ⁽¹⁾	15	2.1	1,000	--	--	--	--	--	--	--	2	1	< 1	--
Nickel	ug/L	NC	NA	100	100	86	2	100	--	--	--	--	--	--	--	7	< 1	< 2	--
Silver	ug/L	100**	NA	34	98	0.20	0.2	34	--	--	--	--	--	--	--	< 0.2	< 0.2	< 0.2	--
Vanadium	ug/L	NC	NA	4.5	62	27	2	4.5	--	--	--	--	--	--	--	16	14	15	--
Zinc	ug/L	5,000**	NA	2,400	5,000 ⁽¹⁾	190	18	2,400	--	--	--	--	--	--	--	10	< 10	< 30	--

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.
- NC - no criteria.
- - not analyzed.
- MCL - Maximum Contaminant Level, EPA Drinking Water Standards and Health Advisories, April 2012.
- RSL - Regional Screening Level from 83 FR 36435.
- UTL - Upper Tolerance Limit (95%) of the background data set.
- GWPS - Groundwater Protection Standard. Appendix IV GWPS is the higher of the MCL/RSL and UTL as established in TRC's Technical Memorandum dated October 15, 2018. Appendix III GWPS is the most restrictive of the MCL/Part 201 criteria, or the UTL if the UTL exceeds the applicable criteria as established in TRC's Technical Memorandum dated December 23, 2019.
- * - Michigan Part 201 Generic Drinking Water Cleanup Criteria, December 30, 2013.
- ** - 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 EGLE policy and procedure 09-014 dated June 20, 2012.
- 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.
- (1) Criterion is the aesthetic drinking water value per footnote (E).
- (2) pH value potentially biased high due to groundwater quality meter malfunction.
- (3) Not sampled; insufficient amount of groundwater present to collect sample.
- (4) JHC-MW-15008 was decommissioned on June 24, 2019. Replacement well JHC-MW-15008R was installed on June 25, 2019.

Table B1
 Comparison of Groundwater Sampling Results to Groundwater Protection Standards for Statistical Evaluation
 JH Campbell Pond A – HMP/AMP
 West Olive, Michigan

Sample Location:									JHC-MW-15008 ⁽⁴⁾					JHC-MW-15008R ⁽⁴⁾						
Sample Date:									9/26/2017	4/26/2018	6/20/2018	11/15/2018 ⁽³⁾	4/24/2019 ⁽³⁾	8/13/2019	10/9/2019	10/9/2019	2/12/2020	4/14/2020	7/16/2020	10/22/2020
Constituent	Unit	EPA MCL	EPA RSL	MI Residential*	MI Non-Residential*	MI GSI [^]	UTL	GWPS	Downgradient											
									Field Dup											
Appendix III																				
Boron	ug/L	NC	NA	500	500	7,200	54	500	116	--	87.7	--	--	93	130	130	423	505	384	285
Calcium	mg/L	NC	NA	NC	NC	500	40	500	37.5	--	39	--	--	33	100	100	94.7	99.9	79.8	109
Chloride	mg/L	250**	NA	250 ⁽¹⁾	250 ⁽¹⁾	500	70	250	16.6	--	20.4	--	--	2.2	16	16	22.4	25.0	25.4	18.8
Fluoride	ug/L	4,000	NA	NC	NC	NC	1,000	4,000	< 1,000	< 1,000	< 1,000	--	--	170	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	250**	NA	250 ⁽¹⁾	250 ⁽¹⁾	500	13	250	28.4	--	25.5	--	--	20	220	220	219	235	183	215
Total Dissolved Solids	mg/L	500**	NA	500 ⁽¹⁾	500 ⁽¹⁾	500	240	500	190	--	210	--	--	150	< 50	430	556	566	536	577
pH, Field	SU	6.5 - 8.5**	NA	6.5 - 8.5 ⁽¹⁾	6.5 - 8.5 ⁽¹⁾	6.5 - 9.0	5.5 - 8.8	5.5 - 8.8	7.1	7.9 ⁽²⁾	7.2	--	--	7.4	7.3	--	7.3	6.9	7.1	7.0
Appendix IV																				
Antimony	ug/L	6	NA	6.0	6.0	130	2	6	--	1.1	< 1.0	--	--	1.2	< 1.0	< 1.0	< 1	1	< 1	1
Arsenic	ug/L	10	NA	10	10	10	1	10	--	< 1.0	< 1.0	--	--	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1	< 1
Barium	ug/L	2,000	NA	2,000	2,000	820	35	2,000	--	118	120	--	--	110	340	320	291	252	219	216
Beryllium	ug/L	4	NA	4.0	4.0	18	1	4	--	< 1.0	< 1.0	--	--	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1	< 1
Cadmium	ug/L	5	NA	5.0	5.0	3.5	0.2	5	--	< 0.20	< 0.20	--	--	< 0.20	< 0.20	< 0.20	< 0.2	< 0.2	< 0.2	< 0.2
Chromium	ug/L	100	NA	100	100	11	2	100	--	1.3	1.5	--	--	3.8	4.5	4.5	7	< 1	< 1	< 1
Cobalt	ug/L	NC	6	40	100	100	15	15	--	< 15.0	< 15.0	--	--	< 6.0	< 6.0	< 6.0	< 6	< 15	< 6	< 6
Fluoride	ug/L	4,000	NA	NC	NC	NC	1,000	4,000	< 1,000	< 1,000	< 1,000	--	--	170	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	15	4.0	4.0	39	1	15	--	< 1.0	< 1.0	--	--	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1	< 1
Lithium	ug/L	NC	40	170	350	440	10	40	--	14	15	--	--	10	15	15	18	19	17	19
Mercury	ug/L	2	NA	2.0	2.0	0.20#	0.2	2	--	< 0.20	< 0.20	--	--	< 0.20	< 0.20	< 0.20	< 0.2	< 0.2	< 0.2	< 0.2
Molybdenum	ug/L	NC	100	73	210	3,200	5	100	--	5.8	5.1	--	--	6.8	< 5.0	< 5.0	< 5	< 5	< 5	5
Radium-226	pCi/L	NC	NA	NC	NC	NC	NA	NA	--	< 0.493	0.928	--	--	0.183	0.449	0.751	--	0.180	--	0.553
Radium-228	pCi/L	NC	NA	NC	NC	NC	NA	NA	--	< 0.847	< 0.698	--	--	0.468	0.817	0.744	--	< 0.429	--	0.330
Radium-226/228	pCi/L	5	NA	NC	NC	NC	1.93	5	--	< 1.34	1.56	--	--	0.651	1.27	1.49	--	0.549	--	0.883
Selenium	ug/L	50	NA	50	50	5.0	5	50	--	1.7	2.0	--	--	12	110	110	11	6	13	68
Thallium	ug/L	2	NA	2.0	2.0	3.7	2	2	--	< 2.0	< 2.0	--	--	< 2.0	< 2.0	< 2.0	< 2	< 2	2	< 2
MI Part 115 Parameters																				
Iron	ug/L	300**	NA	300 ⁽¹⁾	300 ⁽¹⁾	500,000	870	870	--	--	--	--	--	--	99	150	164	134	48	56
Copper	ug/L	1,000**	NA	1,000 ⁽¹⁾	1,000 ⁽¹⁾	15	2.1	1,000	--	--	--	--	--	--	< 1.0	1.1	2	2	2	2
Nickel	ug/L	NC	NA	100	100	86	2	100	--	--	--	--	--	--	2.7	2.6	8	< 1	< 2	< 2
Silver	ug/L	100**	NA	34	98	0.20	0.2	34	--	--	--	--	--	--	< 0.20	< 0.20	< 0.2	< 0.2	< 0.2	< 0.2
Vanadium	ug/L	NC	NA	4.5	62	27	2	4.5	--	--	--	--	--	--	< 2.0	< 2.0	< 2	< 2	< 2	< 2
Zinc	ug/L	5,000**	NA	2,400	5,000 ⁽¹⁾	190	18	2,400	--	--	--	--	--	--	< 10	< 10	< 10	< 10	< 30	< 10

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.
 NC - no criteria.
 -- - not analyzed.
 MCL - Maximum Contaminant Level, EPA Drinking Water Standards and Health Advisories, April 2012.
 RSL - Regional Screening Level from 83 FR 36435.
 UTL - Upper Tolerance Limit (95%) of the background data set.
 GWPS - Groundwater Protection Standard. Appendix IV GWPS is the higher of the MCL/RSL and UTL as established in TRC's Technical Memorandum dated October 15, 2018. Appendix III GWPS is the most restrictive of the MCL/Part 201 criteria, or the UTL if the UTL exceeds the applicable criteria as established in TRC's Technical Memorandum dated December 23, 2019.
 * - Michigan Part 201 Generic Drinking Water Cleanup Criteria, December 30, 2013.
 ** - 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 EGLE policy and procedure 09-014 dated June 20, 2012.
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.
 (1) Criterion is the aesthetic drinking water value per footnote (E).
 (2) pH value potentially biased high due to groundwater quality meter malfunction.
 (3) Not sampled; insufficient amount of groundwater present to collect sample.
 (4) JHC-MW-15008 was decommissioned on June 24, 2019. Replacement well JHC-MW-15008R was installed on June 25, 2019.

Table B1
 Comparison of Groundwater Sampling Results to Groundwater Protection Standards for Statistical Evaluation
 JH Campbell Pond A – HMP/AMP
 West Olive, Michigan

Sample Location:									JHC-MW-15009														
Sample Date:									8/15/2017	9/26/2017	4/26/2018	4/26/2018	6/20/2018	11/15/2018	11/15/2018	4/24/2019	4/24/2019	10/9/2019 ⁽³⁾	2/12/2020	4/14/2020	4/14/2020	7/16/2020	10/22/2020 ⁽³⁾
Constituent	Unit	EPA MCL	EPA RSL	MI Residential*	MI Non-Residential*	MI GSI [^]	UTL	GWPS	Downgradient														
												Field Dup				Field Dup		Field Dup				Field Dup	
Appendix III																							
Boron	ug/L	NC	NA	500	500	7,200	54	500	156	144	--	--	91.4	188	187	200	190	--	468	874	881	401	--
Calcium	mg/L	NC	NA	NC	NC	500	40	500	41.2	34.3	--	--	41.2	46.2	46.4	92	89	--	74.5	78.7	79.9	84.2	--
Chloride	mg/L	250**	NA	250 ⁽¹⁾	250 ⁽¹⁾	500	70	250	20.1	17.7	--	--	22.9	17.7	17.7	17	16	--	10.7	6.95	6.78	6.18	--
Fluoride	ug/L	4,000	NA	NC	NC	NC	1,000	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	--
Sulfate	mg/L	250**	NA	250 ⁽¹⁾	250 ⁽¹⁾	500	13	250	31.6	32.7	--	--	18.2	26.9	27.1	130	130	--	40.5	49.1	49.9	64.4	--
Total Dissolved Solids	mg/L	500**	NA	500 ⁽¹⁾	500 ⁽¹⁾	500	240	500	208	178	--	--	214	234	202	430	440	--	332	354	341	397	--
pH, Field	SU	6.5 - 8.5**	NA	6.5 - 8.5 ⁽¹⁾	6.5 - 8.5 ⁽¹⁾	6.5 - 9.0	5.5 - 8.8	5.5 - 8.8	7.5	7.4	8.4 ⁽²⁾	--	7.7	7.6	--	7.4	--	--	7.5	7.2	--	7.2	--
Appendix IV																							
Antimony	ug/L	6	NA	6.0	6.0	130	2	6	< 1.0	--	< 1.0	< 1.0	< 1.0	1.2	< 1.0	< 1.0	< 1.0	--	< 1	1	1	< 1	--
Arsenic	ug/L	10	NA	10	10	10	1	10	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	--	< 1	< 1	< 1	< 1	--
Barium	ug/L	2,000	NA	2,000	2,000	820	35	2,000	198	--	130	125	130	178	181	360	360	--	287	307	298	290	--
Beryllium	ug/L	4	NA	4.0	4.0	18	1	4	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	--	< 1	< 1	< 1	< 1	--
Cadmium	ug/L	5	NA	5.0	5.0	3.5	0.2	5	< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	--	< 0.2	< 0.2	< 0.2	< 0.2	--
Chromium	ug/L	100	NA	100	100	11	2	100	6.6	--	1.3	1.3	< 1.0	14.1	11.8	17	14	--	31	1	1	1	--
Cobalt	ug/L	NC	6	40	100	100	15	15	< 15.0	--	< 15.0	< 15.0	< 15.0	< 6.0	< 6.0	< 6.0	< 6.0	--	< 6	< 15	< 15	< 6	--
Fluoride	ug/L	4,000	NA	NC	NC	NC	1,000	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	--
Lead	ug/L	NC	15	4.0	4.0	39	1	15	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	--	< 1	< 1	< 1	< 1	--
Lithium	ug/L	NC	40	170	350	440	10	40	11	--	< 10	< 10	< 10	14	14	11	11	--	14	14	14	14	--
Mercury	ug/L	2	NA	2.0	2.0	0.20#	0.2	2	< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	--	< 0.2	< 0.2	< 0.2	< 0.2	--
Molybdenum	ug/L	NC	100	73	210	3,200	5	100	7.4	--	5.5	5.5	< 5.0	6.1	6.1	5.7	5.6	--	15	< 5	< 5	6	--
Radium-226	pCi/L	NC	NA	NC	NC	NC	NA	NA	< 0.455	--	< 0.169	< 0.709	< 0.631	< 0.896	< 0.705	0.351	0.289	--	--	0.394	0.307	--	--
Radium-228	pCi/L	NC	NA	NC	NC	NC	NA	NA	1.04	--	< 1.26	< 1.14	< 0.634	0.800	< 0.663	0.674	0.509	--	--	0.573	0.459	--	--
Radium-226/228	pCi/L	5	NA	NC	NC	NC	1.93	5	< 1.40	--	< 1.43	< 1.85	< 1.27	< 1.47	< 1.37	1.02	0.798	--	--	0.967	0.767	--	--
Selenium	ug/L	50	NA	50	50	5.0	5	50	< 1.0	--	< 1.0	1.0	10.3	12.6	12.6	61	63	--	20	77	79	76	--
Thallium	ug/L	2	NA	2.0	2.0	3.7	2	2	< 2.0	--	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	--	< 2	< 2	< 2	< 2	--
MI Part 115 Parameters																							
Iron	ug/L	300**	NA	300 ⁽¹⁾	300 ⁽¹⁾	500,000	870	870	--	--	--	--	--	--	--	--	--	--	420	< 20	< 20	34	--
Copper	ug/L	1,000**	NA	1,000 ⁽¹⁾	1,000 ⁽¹⁾	15	2.1	1,000	--	--	--	--	--	--	--	--	--	--	4	1	2	3	--
Nickel	ug/L	NC	NA	100	100	86	2	100	--	--	--	--	--	--	--	--	--	--	41	< 1	1	< 2	--
Silver	ug/L	100**	NA	34	98	0.20	0.2	34	--	--	--	--	--	--	--	--	--	--	< 0.2	< 0.2	< 0.2	< 0.2	--
Vanadium	ug/L	NC	NA	4.5	62	27	2	4.5	--	--	--	--	--	--	--	--	--	--	3	< 2	< 2	< 2	--
Zinc	ug/L	5,000**	NA	2,400	5,000 ⁽¹⁾	190	18	2,400	--	--	--	--	--	--	--	--	--	--	< 10	< 10	< 10	< 30	--

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.
 NC - no criteria.
 -- - not analyzed.
 MCL - Maximum Contaminant Level, EPA Drinking Water Standards and Health Advisories, April 2012.
 RSL - Regional Screening Level from 83 FR 36435.
 UTL - Upper Tolerance Limit (95%) of the background data set.
 GWPS - Groundwater Protection Standard. Appendix IV GWPS is the higher of the MCL/RSL and UTL as established in TRC's Technical Memorandum dated October 15, 2018. Appendix III GWPS is the most restrictive of the MCL/Part 201 criteria, or the UTL if the UTL exceeds the applicable criteria as established in TRC's Technical Memorandum dated December 23, 2019.
 * - Michigan Part 201 Generic Drinking Water Cleanup Criteria, December 30, 2013.
 ** - 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 EGLE policy and procedure 09-014 dated June 20, 2012.
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.
 (1) Criterion is the aesthetic drinking water value per footnote (E).
 (2) pH value potentially biased high due to groundwater quality meter malfunction.
 (3) Not sampled; insufficient amount of groundwater present to collect sample.
 (4) JHC-MW-15008 was decommissioned on June 24, 2019. Replacement well JHC-MW-15008R was installed on June 25, 2019.

Table B1
 Comparison of Groundwater Sampling Results to Groundwater Protection Standards for Statistical Evaluation
 JH Campbell Pond A – HMP/AMP
 West Olive, Michigan

Sample Location:									JHC-MW-15010													
Sample Date:									9/26/2017	4/26/2018	6/20/2018	11/14/2018	4/23/2019	10/9/2019	2/11/2020	2/11/2020	4/14/2020	7/16/2020	10/22/2020 ⁽³⁾			
Constituent	Unit	EPA MCL	EPA RSL	MI Residential*	MI Non-Residential*	MI GSI [^]	UTL	GWPS	Downgradient													
Appendix III																						
Boron	ug/L	NC	NA	500	500	7,200	54	500	109	--	98.4	120	2,800	2,800	2,390	2,390	2,350	2,130	--			
Calcium	mg/L	NC	NA	NC	NC	500	40	500	33.0	--	40.9	59.6	58	84	82.9	88.0	82.7	78.1	--			
Chloride	mg/L	250**	NA	250 ⁽¹⁾	250 ⁽¹⁾	500	70	250	17.8	--	22.2	7.9	2.0	< 2.0	2.59	2.61	3.20	1.94	--			
Fluoride	ug/L	4,000	NA	NC	NC	NC	1,000	4,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	--			
Sulfate	mg/L	250**	NA	250 ⁽¹⁾	250 ⁽¹⁾	500	13	250	32.6	--	39.9	33.3	24	32	30.7	31.2	35.9	39.8	--			
Total Dissolved Solids	mg/L	500**	NA	500 ⁽¹⁾	500 ⁽¹⁾	500	240	500	220	--	294	262	270	330	280	319	333	361	--			
pH, Field	SU	6.5 - 8.5**	NA	6.5 - 8.5 ⁽¹⁾	6.5 - 8.5 ⁽¹⁾	6.5 - 9.0	5.5 - 8.8	5.5 - 8.8	7.2	8.0 ⁽²⁾	7.3	7.5	6.6	6.9	7.0	--	6.6	6.6	--			
Appendix IV																						
Antimony	ug/L	6	NA	6.0	6.0	130	2	6	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1	< 1	--			
Arsenic	ug/L	10	NA	10	10	10	1	10	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1	< 1	--			
Barium	ug/L	2,000	NA	2,000	2,000	820	35	2,000	--	137	122	211	250	270	266	267	276	290	--			
Beryllium	ug/L	4	NA	4.0	4.0	18	1	4	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1	< 1	--			
Cadmium	ug/L	5	NA	5.0	5.0	3.5	0.2	5	--	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.2	< 0.2	< 0.2	< 0.2	--			
Chromium	ug/L	100	NA	100	100	11	2	100	--	1.4	1.1	1.5	1.2	370	4	5	1	1	--			
Cobalt	ug/L	NC	6	40	100	100	15	15	--	< 15.0	< 15.0	< 6.0	< 6.0	< 6.0	< 6	< 6	< 15	< 6	--			
Fluoride	ug/L	4,000	NA	NC	NC	NC	1,000	4,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	--			
Lead	ug/L	NC	15	4.0	4.0	39	1	15	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1	< 1	--			
Lithium	ug/L	NC	40	170	350	440	10	40	--	10	< 10	12	13	17	20	20	20	19	--			
Mercury	ug/L	2	NA	2.0	2.0	0.20#	0.2	2	--	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.2	< 0.2	< 0.2	< 0.2	--			
Molybdenum	ug/L	NC	100	73	210	3,200	5	100	--	11.0	7.6	5.0	< 5.0	14	< 5	< 5	< 5	< 5	--			
Radium-226	pCi/L	NC	NA	NC	NC	NC	NA	NA	--	0.505	< 0.489	< 0.858	0.198	0.643	--	--	0.270	--	--			
Radium-228	pCi/L	NC	NA	NC	NC	NC	NA	NA	--	< 1.03	< 0.655	0.814	< 0.326	1.12	--	--	0.752	--	--			
Radium-226/228	pCi/L	5	NA	NC	NC	NC	1.93	5	--	< 1.20	< 1.14	< 1.43	0.515	1.76	--	--	1.02	--	--			
Selenium	ug/L	50	NA	50	50	5.0	5	50	--	3.0	11.0	34.1	32	210	126	126	158	179	--			
Thallium	ug/L	2	NA	2.0	2.0	3.7	2	2	--	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2	< 2	< 2	< 2	--			
MI Part 115 Parameters																						
Iron	ug/L	300**	NA	300 ⁽¹⁾	300 ⁽¹⁾	500,000	870	870	--	--	--	--	--	2,100	25	31	< 20	27	--			
Copper	ug/L	1,000**	NA	1,000 ⁽¹⁾	1,000 ⁽¹⁾	15	2.1	1,000	--	--	--	--	--	12	2	2	1	2	--			
Nickel	ug/L	NC	NA	100	100	86	2	100	--	--	--	--	--	200	2	2	< 1	< 2	--			
Silver	ug/L	100**	NA	34	98	0.20	0.2	34	--	--	--	--	--	0.48	< 0.2	< 0.2	< 0.2	< 0.2	--			
Vanadium	ug/L	NC	NA	4.5	62	27	2	4.5	--	--	--	--	--	5.5	4	4	4	4	--			
Zinc	ug/L	5,000**	NA	2,400	5,000 ⁽¹⁾	190	18	2,400	--	--	--	--	--	<10	11	12	< 10	< 30	--			

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.

NC - no criteria.

-- - not analyzed.

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

RSL - Regional Screening Level from 83 FR 36435.

UTL - Upper Tolerance Limit (95%) of the background data set.

GWPS - Groundwater Protection Standard. Appendix IV GWPS is the higher of the MCL/RSL and UTL as established in TRC's

Technical Memorandum dated October 15, 2018. Appendix III GWPS is the most restrictive of the MCL/Part 201 criteria, or the UTL if the UTL exceeds the applicable criteria as established in TRC's Technical Memorandum dated December 23, 2019.

* - Michigan Part 201 Generic Drinking Water Cleanup Criteria, December 30, 2013.

** - 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 EGLE policy and procedure 09-014 dated June 20, 2012.

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.

(1) Criterion is the aesthetic drinking water value per footnote (E).

(2) pH value potentially biased high due to groundwater quality meter malfunction.

(3) Not sampled; insufficient amount of groundwater present to collect sample.

(4) JHC-MW-15008 was decommissioned on June 24, 2019. Replacement well JHC-MW-15008R was installed on June 25, 2019.

Table B1
 Comparison of Groundwater Sampling Results to Groundwater Protection Standards for Statistical Evaluation
 JH Campbell Pond A – HMP/AMP
 West Olive, Michigan

Sample Location:									JHC-MW-15011							
Sample Date:									6/19/2018	11/15/2018	4/23/2019	10/10/2019	2/12/2020	4/15/2020	7/16/2020	10/22/2020
Constituent	Unit	EPA MCL	EPA RSL	MI Residential*	MI Non-Residential*	MI GSI^	UTL	GWPS	Downgradient							
Appendix III																
Boron	ug/L	NC	NA	500	500	7,200	54	500	229	337	440	690	1,910	2,870	2,720	4,120
Calcium	mg/L	NC	NA	NC	NC	500	40	500	30.3	29.1	43	110	122	112	86.7	122
Chloride	mg/L	250**	NA	250 ⁽¹⁾	250 ⁽¹⁾	500	70	250	23.0	21.0	18	9.4	5.71	4.16	10.4	3.79
Fluoride	ug/L	4,000	NA	NC	NC	NC	1,000	4,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	250**	NA	250 ⁽¹⁾	250 ⁽¹⁾	500	13	250	26.1	29.2	86	180	192	183	136	141
Total Dissolved Solids	mg/L	500**	NA	500 ⁽¹⁾	500 ⁽¹⁾	500	240	500	180	150	280	550	654	542	499	546
pH, Field	SU	6.5 - 8.5**	NA	6.5 - 8.5 ⁽¹⁾	6.5 - 8.5 ⁽¹⁾	6.5 - 9.0	5.5 - 8.8	5.5 - 8.8	8.1	9.1	8.8	8.4	8.0	7.6	7.7	7.6
Appendix IV																
Antimony	ug/L	6	NA	6.0	6.0	130	2	6	< 1.0	< 1.0	< 1.0	< 1.0	2	4	2	2
Arsenic	ug/L	10	NA	10	10	10	1	10	15.0	32.2	36	44	31	25	22	22
Barium	ug/L	2,000	NA	2,000	2,000	820	35	2,000	123	98.6	170	360	563	514	419	430
Beryllium	ug/L	4	NA	4.0	4.0	18	1	4	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1	< 1
Cadmium	ug/L	5	NA	5.0	5.0	3.5	0.2	5	< 0.20	< 0.20	< 0.20	< 0.20	< 0.2	0.2	< 0.2	0.5
Chromium	ug/L	100	NA	100	100	11	2	100	< 1.0	< 1.0	9.0	1.4	1	< 1	< 1	< 1
Cobalt	ug/L	NC	6	40	100	100	15	15	< 15.0	< 6.0	< 6.0	< 6.0	< 6	< 6	< 6	< 6
Fluoride	ug/L	4,000	NA	NC	NC	NC	1,000	4,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	15	4.0	4.0	39	1	15	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1	< 1
Lithium	ug/L	NC	40	170	350	440	10	40	11	10	< 10	14	22	21	20	17
Mercury	ug/L	2	NA	2.0	2.0	0.20#	0.2	2	< 0.20	< 0.20	< 0.20	< 0.20	< 0.2	< 0.2	< 0.2	< 0.2
Molybdenum	ug/L	NC	100	73	210	3,200	5	100	8.2	9.3	21	11	12	7	28	< 5
Radium-226	pCi/L	NC	NA	NC	NC	NC	NA	NA	< 0.463	< 0.512	0.0720	0.2980	--	0.242	--	0.344
Radium-228	pCi/L	NC	NA	NC	NC	NC	NA	NA	0.931	< 0.519	< 0.343	0.665	--	0.606	--	< 0.264
Radium-226/228	pCi/L	5	NA	NC	NC	NC	1.93	5	< 1.34	< 1.03	< 0.343	0.963	--	0.848	--	0.497
Selenium	ug/L	50	NA	50	50	5.0	5	50	1.6	< 1.0	13	76	104	29	20	308
Thallium	ug/L	2	NA	2.0	2.0	3.7	2	2	< 2.0	< 2.0	< 2.0	< 2.0	< 2	< 2	< 2	< 2
MI Part 115 Parameters																
Iron	ug/L	300**	NA	300 ⁽¹⁾	300 ⁽¹⁾	500,000	870	870	--	--	--	120	178	145	115	< 20
Copper	ug/L	1,000**	NA	1,000 ⁽¹⁾	1,000 ⁽¹⁾	15	2.1	1,000	--	--	--	< 1.0	1	1	2	1
Nickel	ug/L	NC	NA	100	100	86	2	100	--	--	--	< 2.0	4	< 2	< 2	< 2
Silver	ug/L	100**	NA	34	98	0.20	0.2	34	--	--	--	< 0.20	< 0.2	< 0.4	< 0.2	< 0.2
Vanadium	ug/L	NC	NA	4.5	62	27	2	4.5	--	--	--	14	42	40	30	49
Zinc	ug/L	5,000**	NA	2,400	5,000 ⁽¹⁾	190	18	2,400	--	--	--	< 10	< 10	< 10	< 30	< 10

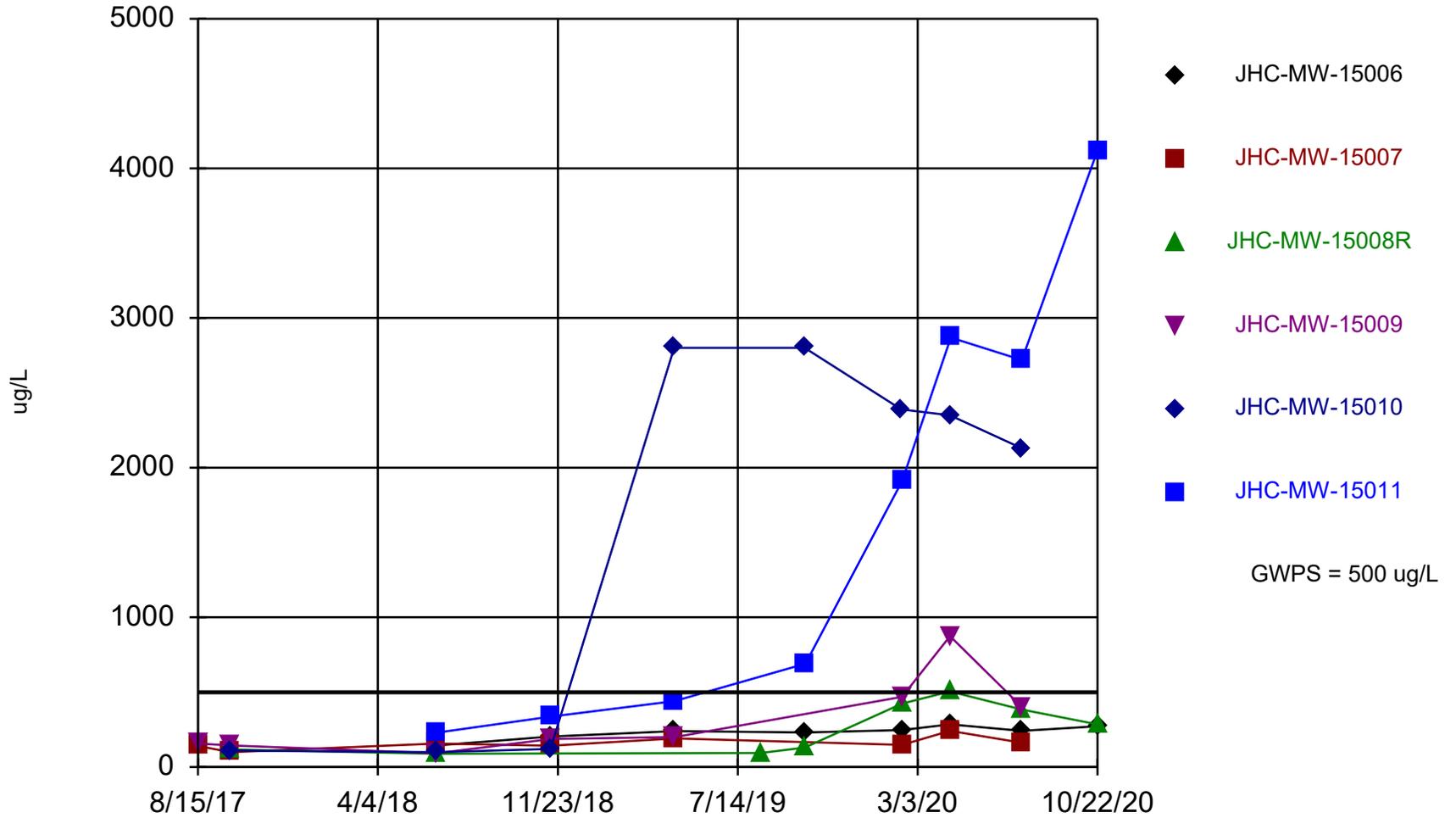
Notes:

- 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.
- NC - no criteria.
- - not analyzed.
- MCL - Maximum Contaminant Level, EPA Drinking Water Standards and Health Advisories, April 2012.
- RSL - Regional Screening Level from 83 FR 36435.
- UTL - Upper Tolerance Limit (95%) of the background data set.
- GWPS - Groundwater Protection Standard. Appendix IV GWPS is the higher of the MCL/RSL and UTL as established in TRC's Technical Memorandum dated October 15, 2018. Appendix III GWPS is the most restrictive of the MCL/Part 201 criteria, or the UTL if the UTL exceeds the applicable criteria as established in TRC's Technical Memorandum dated December 23, 2019.
- * - Michigan Part 201 Generic Drinking Water Cleanup Criteria, December 30, 2013.
- ** - 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 EGLE policy and procedure 09-014 dated June 20, 2012.
- 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.
- (1) Criterion is the aesthetic drinking water value per footnote {E}.
- (2) pH value potentially biased high due to groundwater quality meter malfunction.
- (3) Not sampled; insufficient amount of groundwater present to collect sample.
- (4) JHC-MW-15008 was decommissioned on June 24, 2019. Replacement well JHC-MW-15008R was installed on June 25, 2019.

Attachment 1

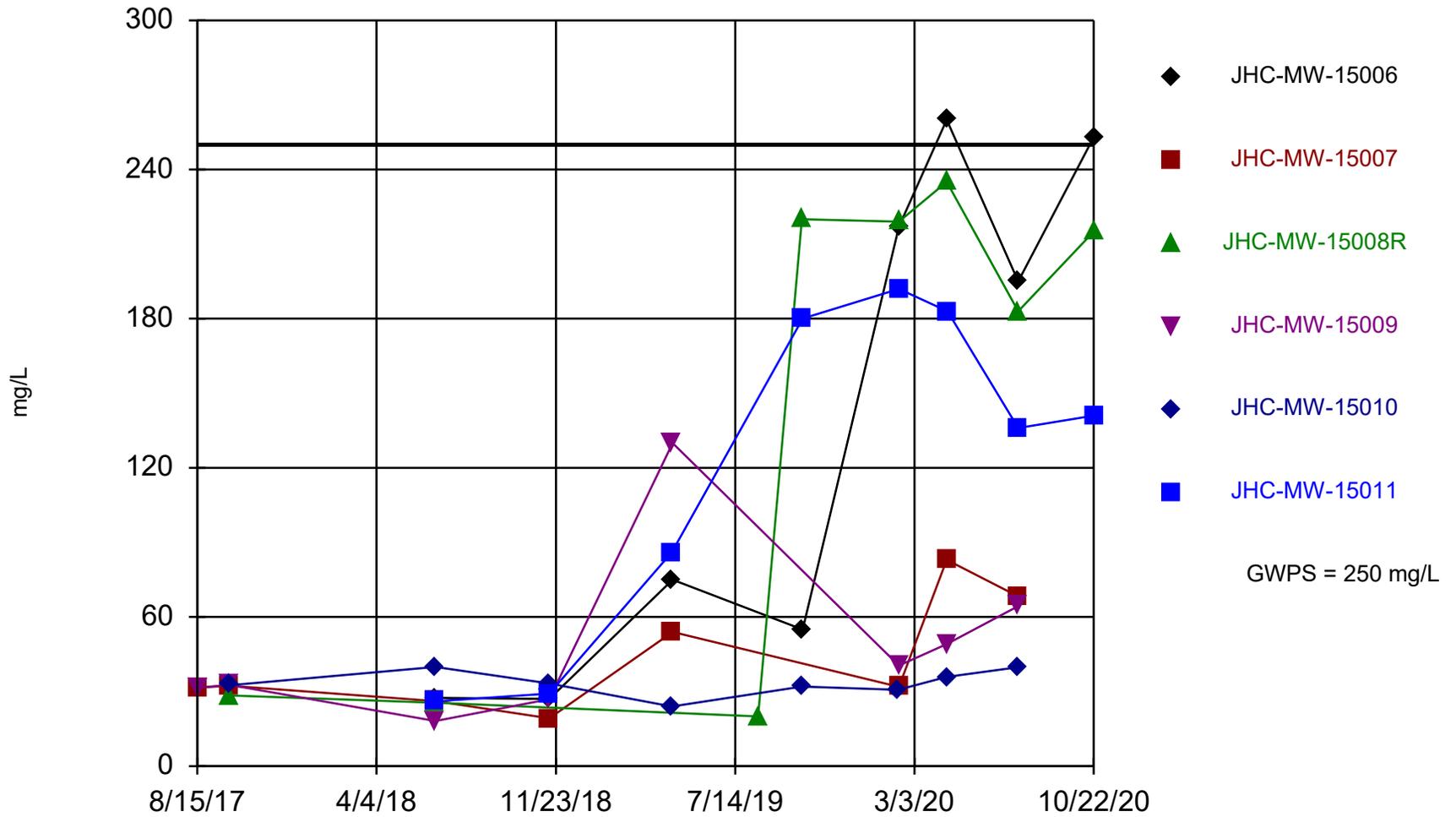
Sanitas™ Output

Boron Comparison to GWPS



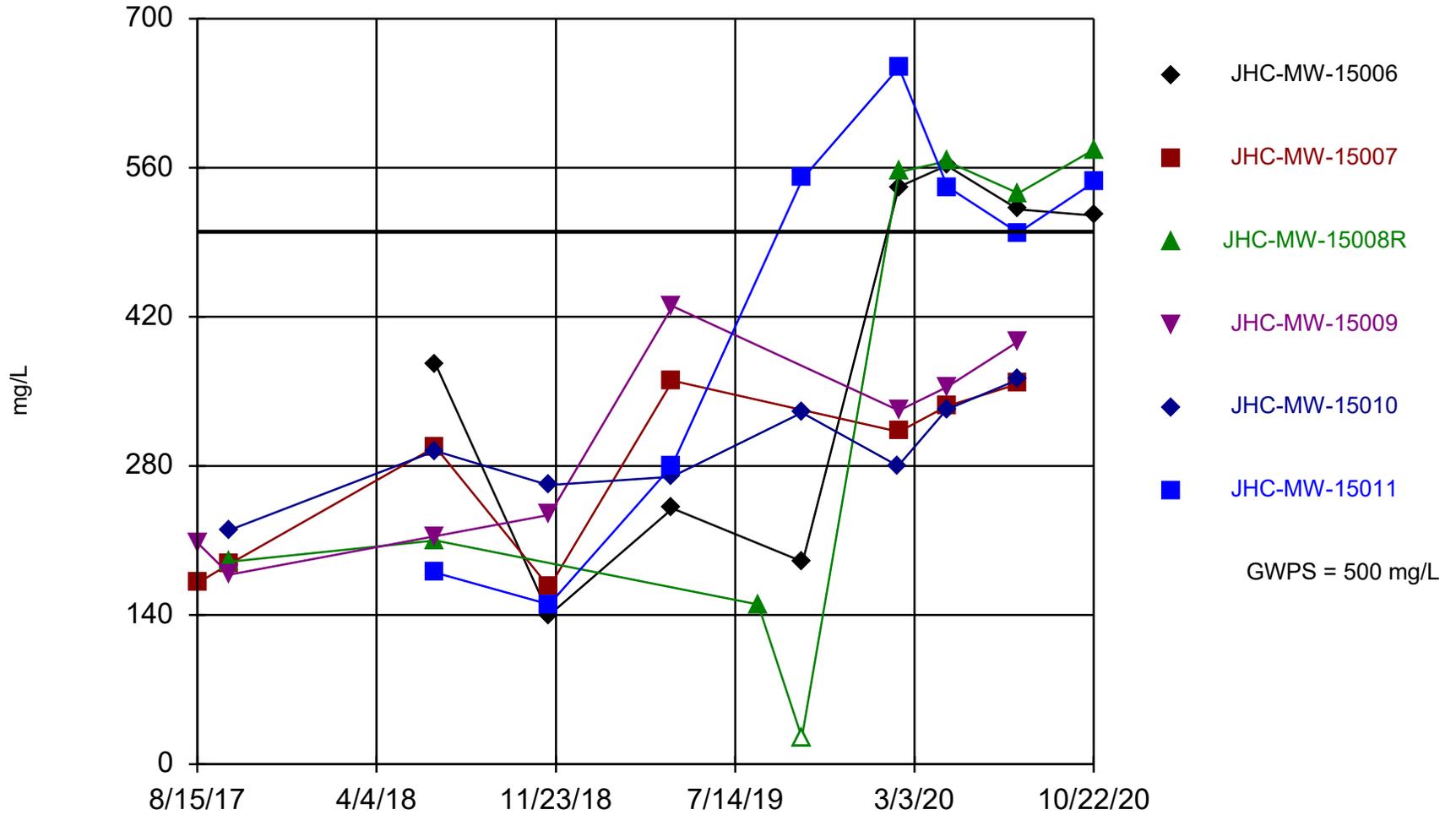
Time Series Analysis Run 12/3/2020 3:13 PM
Client: Consumers Energy Data: JHC_CCR_PondA_NE_20.11.30

Sulfate Comparison to GWPS



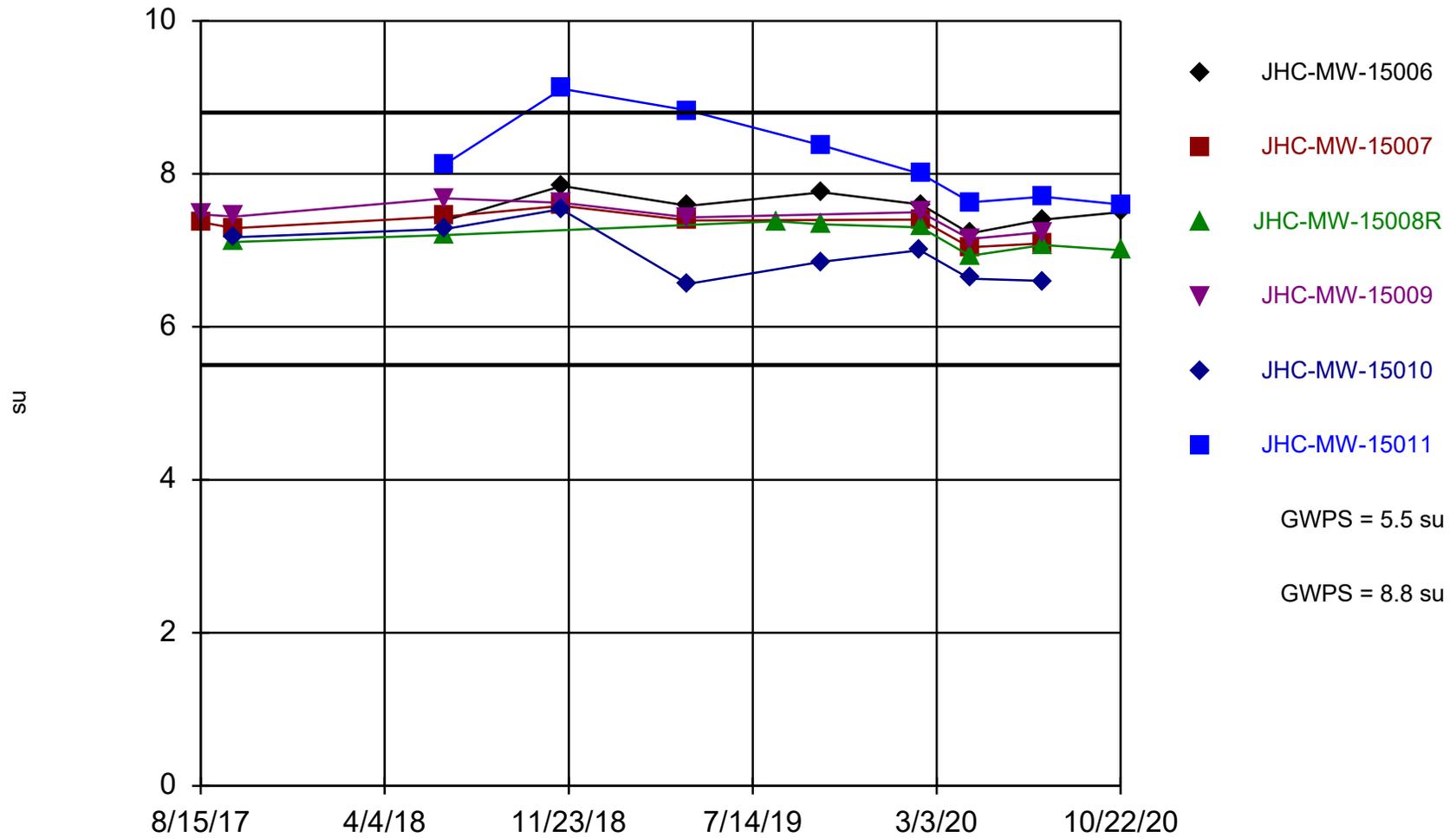
Time Series Analysis Run 12/3/2020 3:17 PM
Client: Consumers Energy Data: JHC_CCR_PondA_NE_20.11.30

Total Dissolved Solids Comparison to GWPS



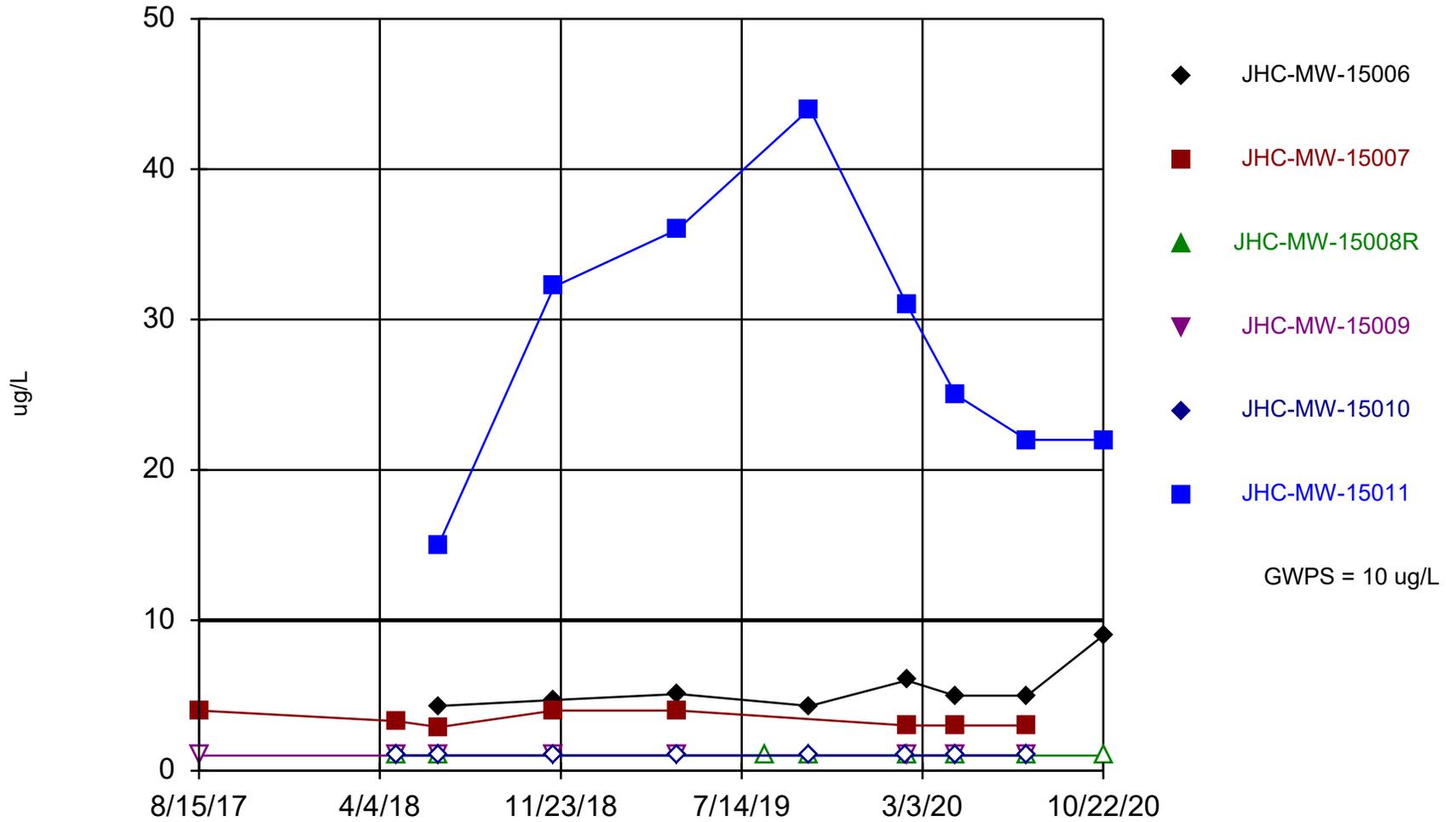
Time Series Analysis Run 12/3/2020 3:19 PM
Client: Consumers Energy Data: JHC_CCR_PondA_NE_20.11.30

pH Comparison to GWPS



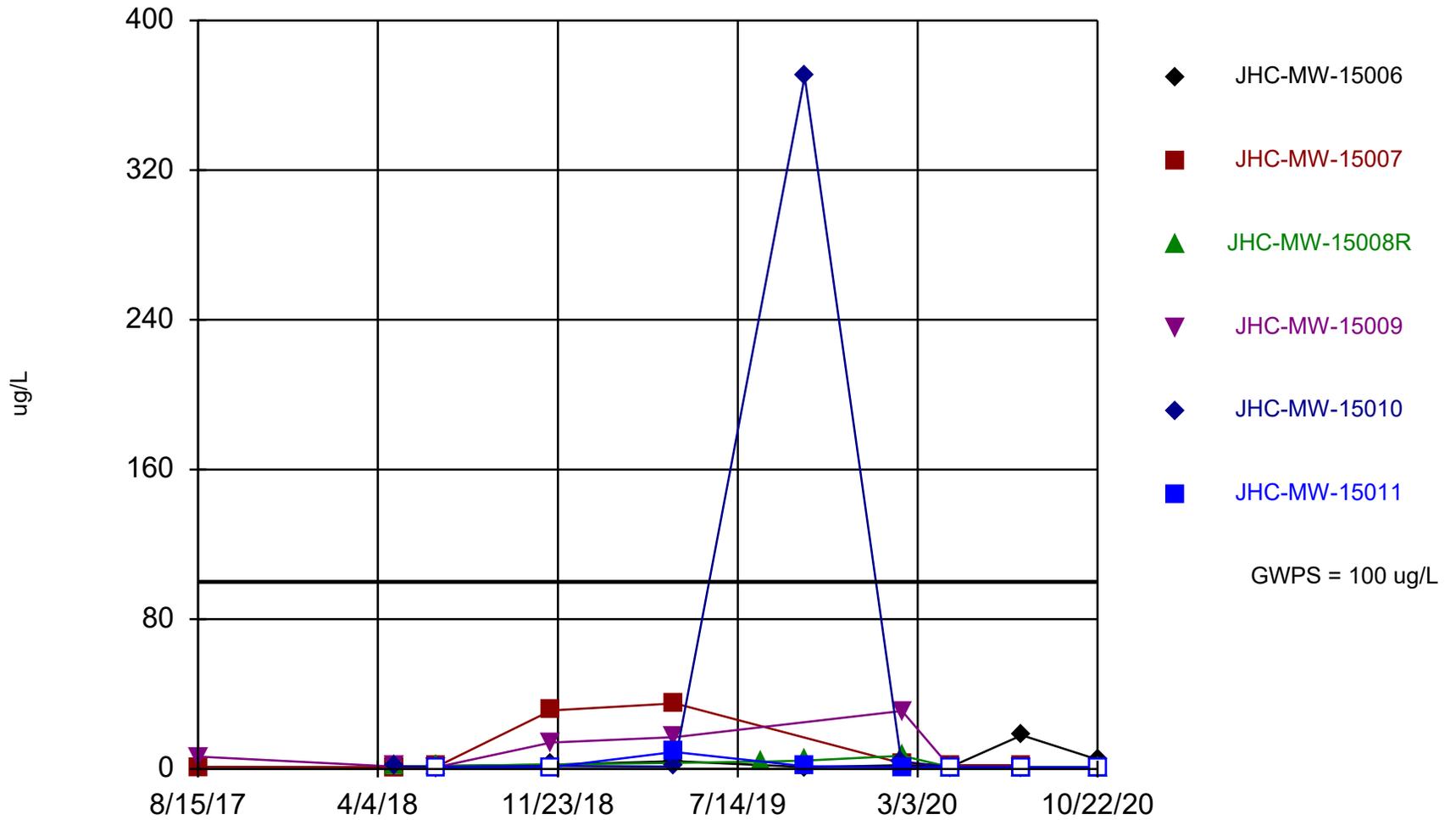
Time Series Analysis Run 12/3/2020 3:20 PM
Client: Consumers Energy Data: JHC_CCR_PondA_NE_20.11.30

Arsenic Comparison to GWPS



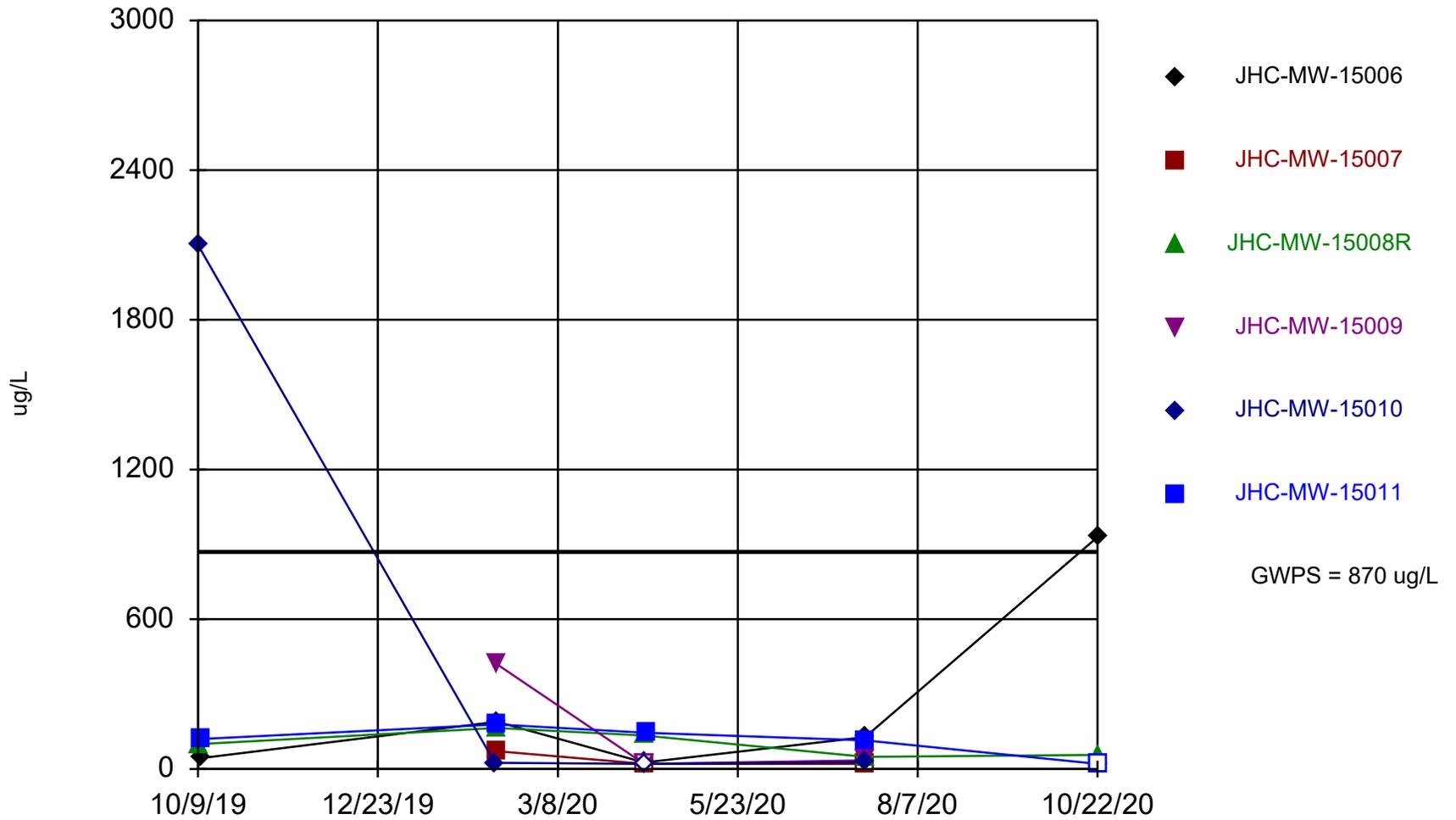
Time Series Analysis Run 12/3/2020 3:22 PM
Client: Consumers Energy Data: JHC_CCR_PondA_NE_20.11.30

Chromium Comparison to GWPS



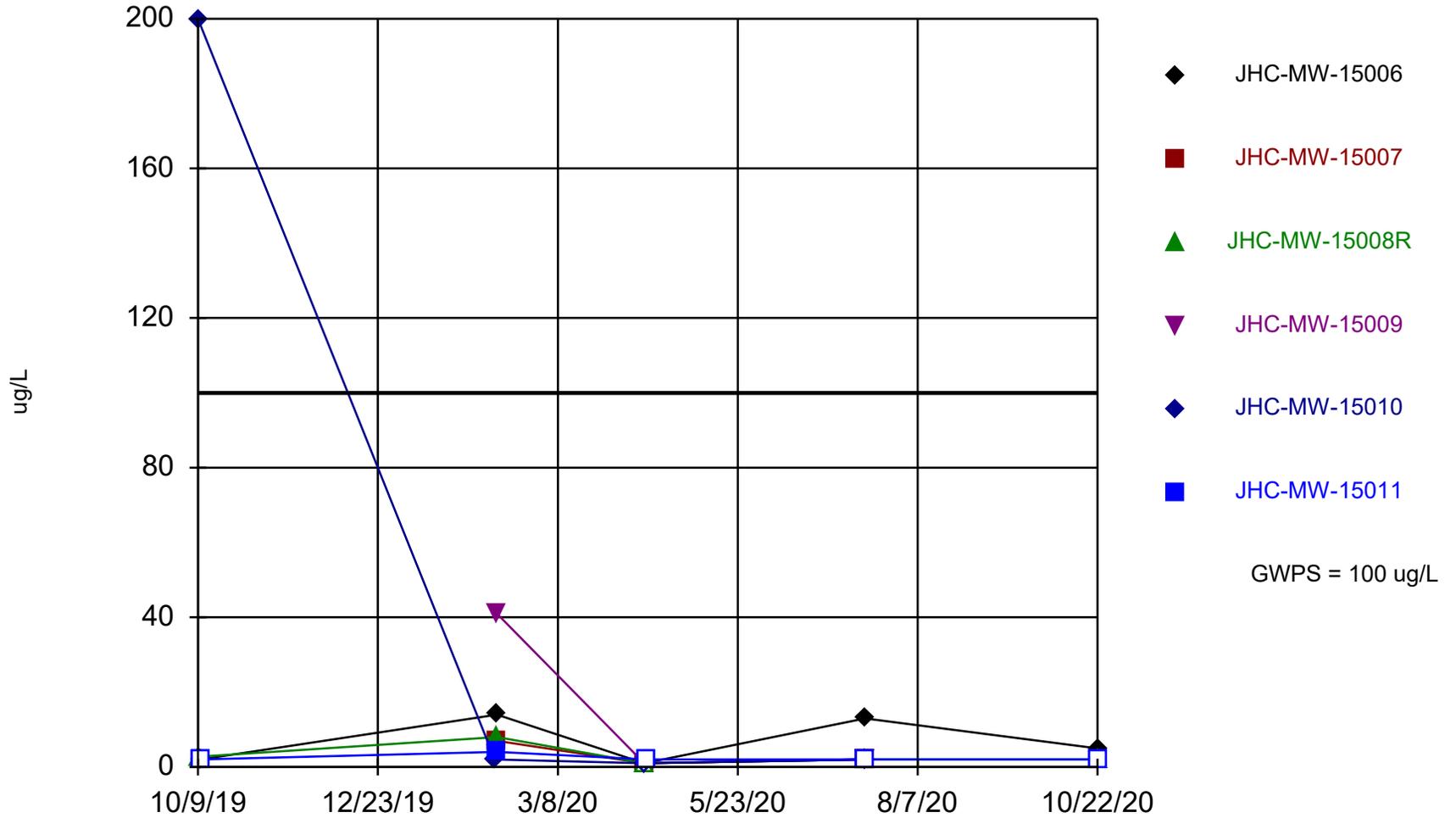
Time Series Analysis Run 12/3/2020 3:53 PM
Client: Consumers Energy Data: JHC_CCR_PondA_NE_20.11.30

Iron Comparison to GWPS



Time Series Analysis Run 12/3/2020 3:23 PM
Client: Consumers Energy Data: JHC_CCR_PondA_NE_20.11.30

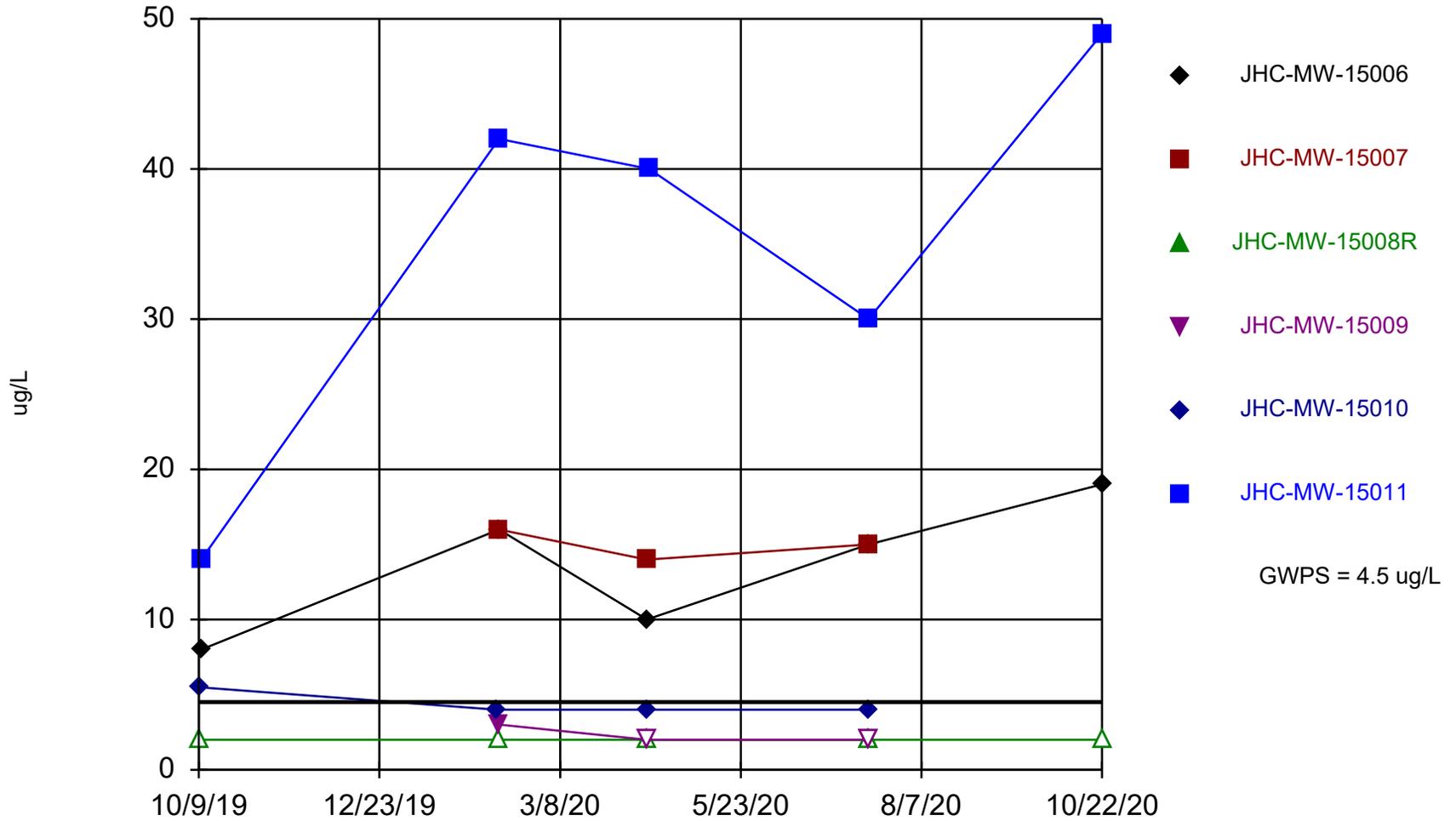
Nickel Comparison to GWPS



Time Series Analysis Run 12/3/2020 3:25 PM

Client: Consumers Energy Data: JHC_CCR_PondA_NE_20.11.30

Vanadium Comparison to GWPS



Time Series Analysis Run 12/3/2020 3:28 PM
Client: Consumers Energy Data: JHC_CCR_PondA_NE_20.11.30

Summary Report

Constituent: Boron, Total Analysis Run 12/3/2020 3:16 PM
 Client: Consumers Energy Data: JHC_CCR_PondA_NE_20.11.30

For observations made between 8/15/2017 and 10/22/2020, a summary of the selected data set:

Observations = 48
 ND/Trace = 0
 Wells = 6
 Minimum Value = 87.7
 Maximum Value = 4120
 Mean Value = 704.2
 Median Value = 241
 Standard Deviation = 1005
 Coefficient of Variation = 1.426
 Skewness = 1.818

<u>Well</u>	<u>#Obs.</u>	<u>ND/Trace</u>	<u>Min</u>	<u>Max</u>	<u>Mean</u>	<u>Median</u>	<u>Std.Dev.</u>	<u>CV</u>	<u>Skewness</u>
JHC-MW-15006	8	0	144	284	232.8	241	43.55	0.1871	-0.9729
JHC-MW-15007	8	0	98	242	159.9	152	41.98	0.2626	0.6808
JHC-MW-15008R	8	0	87.7	505	253	207.5	167.9	0.6639	0.3281
JHC-MW-15009	8	0	91.4	874	315.3	194	261.1	0.8281	1.327
JHC-MW-15010	8	0	98.4	2800	1600	2240	1254	0.7842	-0.4187
JHC-MW-15011	8	0	229	4120	1665	1300	1460	0.8774	0.4751

Summary Report

Constituent: Sulfate Analysis Run 12/3/2020 3:18 PM
 Client: Consumers Energy Data: JHC_CCR_PondA_NE_20.11.30

For observations made between 8/15/2017 and 10/22/2020, a summary of the selected data set:

Observations = 48
 ND/Trace = 0
 Wells = 6
 Minimum Value = 18.2
 Maximum Value = 260
 Mean Value = 88.27
 Median Value = 40.2
 Standard Deviation = 78.83
 Coefficient of Variation = 0.8931
 Skewness = 0.9299

<u>Well</u>	<u>#Obs.</u>	<u>ND/Trace</u>	<u>Min</u>	<u>Max</u>	<u>Mean</u>	<u>Median</u>	<u>Std.Dev.</u>	<u>CV</u>	<u>Skewness</u>
JHC-MW-15006	8	0	27	260	138.7	135	102.1	0.7363	0.04673
JHC-MW-15007	8	0	19.2	83	43.31	32.1	22.6	0.5219	0.7388
JHC-MW-15008R	8	0	20	235	143.2	199	99.3	0.6932	-0.4564
JHC-MW-15009	8	0	18.2	130	49.18	36.6	35.61	0.7241	1.624
JHC-MW-15010	8	0	24	39.9	33.53	32.95	5.177	0.1544	-0.4089
JHC-MW-15011	8	0	26.1	192	121.7	138.5	67.24	0.5527	-0.4628

Summary Report

Constituent: Total Dissolved Solids Analysis Run 12/3/2020 3:20 PM

Client: Consumers Energy Data: JHC_CCR_PondA_NE_20.11.30

For observations made between 8/15/2017 and 10/22/2020, a summary of the selected data set:

Observations = 48

ND/Trace = 1

Wells = 6

Minimum Value = 25

Maximum Value = 654

Mean Value = 337.1

Median Value = 321

Standard Deviation = 153.7

Coefficient of Variation = 0.4559

Skewness = 0.3031

<u>Well</u>	<u>#Obs.</u>	<u>ND/Trace</u>	<u>Min</u>	<u>Max</u>	<u>Mean</u>	<u>Median</u>	<u>Std.Dev.</u>	<u>CV</u>	<u>Skewness</u>
JHC-MW-15006	8	0	140	562	385.8	445.5	173.4	0.4496	-0.3372
JHC-MW-15007	8	0	166	360	273.4	305	84.53	0.3092	-0.357
JHC-MW-15008R	8	1	25	577	351.3	373	228.7	0.651	-0.1736
JHC-MW-15009	8	0	178	430	293.4	283	96.36	0.3285	0.1837
JHC-MW-15010	8	0	220	361	293.8	287	45.63	0.1554	-0.05928
JHC-MW-15011	8	0	150	654	425.1	520.5	192.2	0.4521	-0.4498

Summary Report

Constituent: pH, Field Analysis Run 12/3/2020 3:21 PM
 Client: Consumers Energy Data: JHC_CCR_PondA_NE_20.11.30

For observations made between 8/15/2017 and 10/22/2020, a summary of the selected data set:

Observations = 48
 ND/Trace = 0
 Wells = 6
 Minimum Value = 6.56
 Maximum Value = 9.11
 Mean Value = 7.432
 Median Value = 7.395
 Standard Deviation = 0.4834
 Coefficient of Variation = 0.06504
 Skewness = 1.23

<u>Well</u>	<u>#Obs.</u>	<u>ND/Trace</u>	<u>Min</u>	<u>Max</u>	<u>Mean</u>	<u>Median</u>	<u>Std.Dev.</u>	<u>CV</u>	<u>Skewness</u>
JHC-MW-15006	8	0	7.22	7.84	7.536	7.54	0.2034	0.02699	0.04057
JHC-MW-15007	8	0	7.04	7.58	7.325	7.38	0.1804	0.02463	-0.4495
JHC-MW-15008R	8	0	6.93	7.38	7.166	7.155	0.1651	0.02304	-0.0478
JHC-MW-15009	8	0	7.15	7.68	7.441	7.455	0.1768	0.02375	-0.3681
JHC-MW-15010	8	0	6.56	7.54	6.954	6.925	0.3575	0.05142	0.3544
JHC-MW-15011	8	0	7.6	9.11	8.17	8.06	0.5642	0.06905	0.5737

Summary Report

Constituent: Arsenic, Total Analysis Run 12/3/2020 3:22 PM
 Client: Consumers Energy Data: JHC_CCR_PondA_NE_20.11.30

For observations made between 8/15/2017 and 10/22/2020, a summary of the selected data set:

Observations = 48
 ND/Trace = 24
 Wells = 6
 Minimum Value = 1
 Maximum Value = 44
 Mean Value = 6.704
 Median Value = 1.95
 Standard Deviation = 10.58
 Coefficient of Variation = 1.578
 Skewness = 2.124

<u>Well</u>	<u>#Obs.</u>	<u>ND/Trace</u>	<u>Min</u>	<u>Max</u>	<u>Mean</u>	<u>Median</u>	<u>Std.Dev.</u>	<u>CV</u>	<u>Skewness</u>
JHC-MW-15006	8	0	4.3	9	5.425	5	1.542	0.2842	1.77
JHC-MW-15007	8	0	2.9	4	3.4	3.15	0.5099	0.15	0.3801
JHC-MW-15008R	8	8	1	1	1	1	0	0	NaN
JHC-MW-15009	8	8	1	1	1	1	0	0	NaN
JHC-MW-15010	8	8	1	1	1	1	0	0	NaN
JHC-MW-15011	8	0	15	44	28.4	28	9.222	0.3247	0.2605

Summary Report

Constituent: Chromium, Total Analysis Run 12/3/2020 3:53 PM
 Client: Consumers Energy Data: JHC_CCR_PondA_NE_20.11.30

For observations made between 8/15/2017 and 10/22/2020, a summary of the selected data set:

Observations = 48
 ND/Trace = 11
 Wells = 6
 Minimum Value = 1
 Maximum Value = 370
 Mean Value = 12.57
 Median Value = 1.4
 Standard Deviation = 53.32
 Coefficient of Variation = 4.243
 Skewness = 6.473

<u>Well</u>	<u>#Obs.</u>	<u>ND/Trace</u>	<u>Min</u>	<u>Max</u>	<u>Mean</u>	<u>Median</u>	<u>Std.Dev.</u>	<u>CV</u>	<u>Skewness</u>
JHC-MW-15006	8	1	1	18	4.363	2.15	5.696	1.306	1.996
JHC-MW-15007	8	1	1	35	9.575	2	14.6	1.525	1.164
JHC-MW-15008R	8	3	1	7	2.638	1.4	2.235	0.8475	1.012
JHC-MW-15009	8	1	1	31	9.125	3.95	10.9	1.194	1.06
JHC-MW-15010	8	0	1	370	47.65	1.3	130.3	2.734	2.268
JHC-MW-15011	8	5	1	9	2.05	1	2.812	1.372	2.257

Summary Report

Constituent: Selenium, Total Analysis Run 12/3/2020 3:28 PM
 Client: Consumers Energy Data: JHC_CCR_PondA_NE_20.11.30

For observations made between 8/15/2017 and 10/22/2020, a summary of the selected data set:

Observations = 48
 ND/Trace = 8
 Wells = 6
 Minimum Value = 1
 Maximum Value = 308
 Mean Value = 39.42
 Median Value = 11.5
 Standard Deviation = 64.01
 Coefficient of Variation = 1.624
 Skewness = 2.372

<u>Well</u>	<u>#Obs.</u>	<u>ND/Trace</u>	<u>Min</u>	<u>Max</u>	<u>Mean</u>	<u>Median</u>	<u>Std.Dev.</u>	<u>CV</u>	<u>Skewness</u>
JHC-MW-15006	8	3	1	9	3.538	1.65	3.35	0.9471	0.7761
JHC-MW-15007	8	2	1	23	9.438	2.7	10.73	1.137	0.4928
JHC-MW-15008R	8	0	1.7	110	27.96	11.5	39.54	1.414	1.378
JHC-MW-15009	8	2	1	77	32.36	16.3	33.2	1.026	0.4737
JHC-MW-15010	8	0	3	210	94.14	80.05	83.15	0.8833	0.1783
JHC-MW-15011	8	1	1	308	69.08	24.5	103.3	1.496	1.76

Summary Report

Constituent: Iron, Total Analysis Run 12/3/2020 3:25 PM
 Client: Consumers Energy Data: JHC_CCR_PondA_NE_20.11.30

For observations made between 10/9/2019 and 10/22/2020, a summary of the selected data set:

Observations = 25
 ND/Trace = 5
 Wells = 6
 Minimum Value = 20
 Maximum Value = 2100
 Mean Value = 206
 Median Value = 71
 Standard Deviation = 437.5
 Coefficient of Variation = 2.123
 Skewness = 3.611

<u>Well</u>	<u>#Obs.</u>	<u>ND/Trace</u>	<u>Min</u>	<u>Max</u>	<u>Mean</u>	<u>Median</u>	<u>Std.Dev.</u>	<u>CV</u>	<u>Skewness</u>
JHC-MW-15006	5	0	26	929	263	128	378.1	1.438	1.389
JHC-MW-15007	3	2	20	71	37	20	29.44	0.7958	0.7071
JHC-MW-15008R	5	0	48	164	100.2	99	49.73	0.4963	0.1584
JHC-MW-15009	3	1	20	420	158	34	227	1.437	0.7041
JHC-MW-15010	4	1	20	2100	543	26	1038	1.912	1.155
JHC-MW-15011	5	1	20	178	115.6	120	58.99	0.5103	-0.8243

Summary Report

Constituent: Nickel, Total Analysis Run 12/3/2020 3:26 PM
 Client: Consumers Energy Data: JHC_CCR_PondA_NE_20.11.30

For observations made between 10/9/2019 and 10/22/2020, a summary of the selected data set:

Observations = 25
 ND/Trace = 14
 Wells = 6
 Minimum Value = 1
 Maximum Value = 200
 Mean Value = 12.87
 Median Value = 2
 Standard Deviation = 39.85
 Coefficient of Variation = 3.097
 Skewness = 4.401

<u>Well</u>	<u>#Obs.</u>	<u>ND/Trace</u>	<u>Min</u>	<u>Max</u>	<u>Mean</u>	<u>Median</u>	<u>Std.Dev.</u>	<u>CV</u>	<u>Skewness</u>
JHC-MW-15006	5	1	1	14	7	5	6.124	0.8748	0.2556
JHC-MW-15007	3	2	1	7	3.333	2	3.215	0.9644	0.6309
JHC-MW-15008R	5	3	1	8	3.14	2	2.784	0.8865	1.321
JHC-MW-15009	3	2	1	41	14.67	2	22.81	1.555	0.7056
JHC-MW-15010	4	2	1	200	51.25	2	99.17	1.935	1.155
JHC-MW-15011	5	4	2	4	2.4	2	0.8944	0.3727	1.5

Summary Report

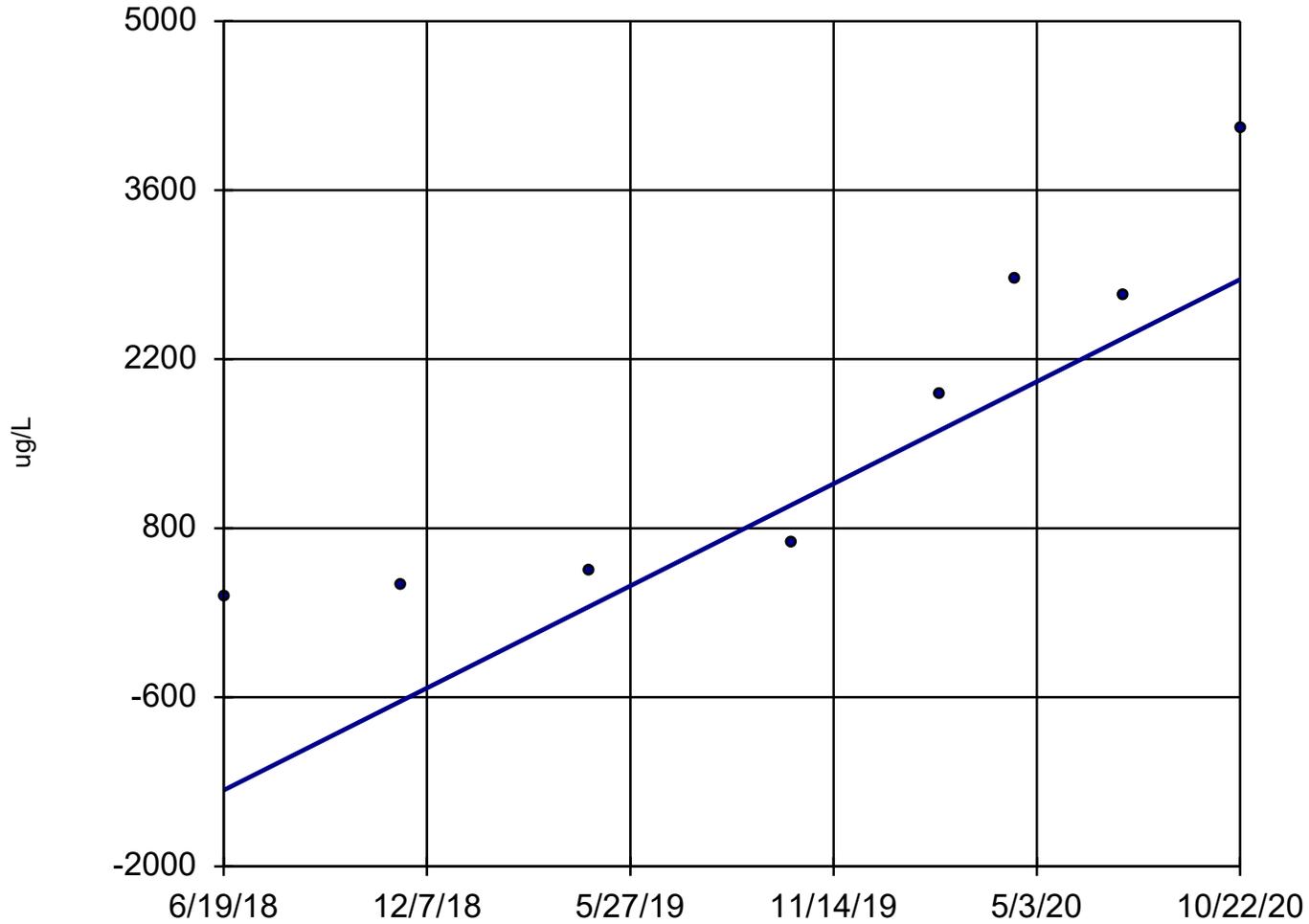
Constituent: Vanadium, Total Analysis Run 12/3/2020 3:29 PM
 Client: Consumers Energy Data: JHC_CCR_PondA_NE_20.11.30

For observations made between 10/9/2019 and 10/22/2020, a summary of the selected data set:

Observations = 25
 ND/Trace = 7
 Wells = 6
 Minimum Value = 2
 Maximum Value = 49
 Mean Value = 12.9
 Median Value = 8
 Standard Deviation = 13.69
 Coefficient of Variation = 1.061
 Skewness = 1.395

<u>Well</u>	<u>#Obs.</u>	<u>ND/Trace</u>	<u>Min</u>	<u>Max</u>	<u>Mean</u>	<u>Median</u>	<u>Std.Dev.</u>	<u>CV</u>	<u>Skewness</u>
JHC-MW-15006	5	0	8	19	13.6	15	4.506	0.3313	-0.1474
JHC-MW-15007	3	0	14	16	15	15	1	0.06667	0
JHC-MW-15008R	5	5	2	2	2	2	0	0	NaN
JHC-MW-15009	3	2	2	3	2.333	2	0.5774	0.2474	0.7071
JHC-MW-15010	4	0	4	5.5	4.375	4	0.75	0.1714	1.155
JHC-MW-15011	5	0	14	49	35	40	13.56	0.3876	-0.6914

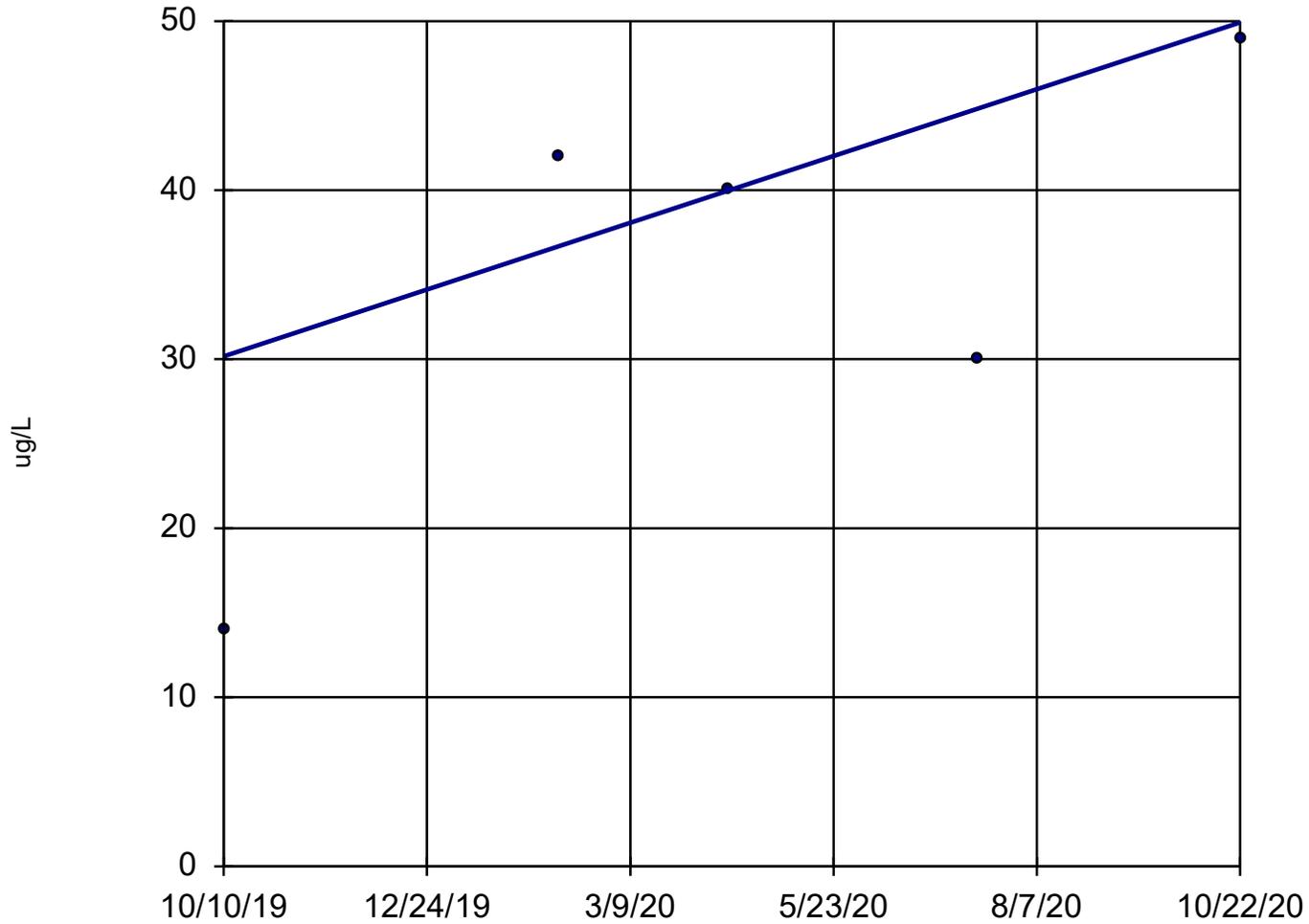
Boron, Total JHC-MW-15011



n = 8
Slope = 1804 units per year.
Mann-Kendall statistic = 26
critical = 20
Increasing trend significant at 98% confidence level ($\alpha = 0.01$ per tail).

Sen's Slope Estimator Analysis Run 12/3/2020 3:31 PM
Client: Consumers Energy Data: JHC_CCR_PondA_NE_20.11.30

Vanadium, Total JHC-MW-15011

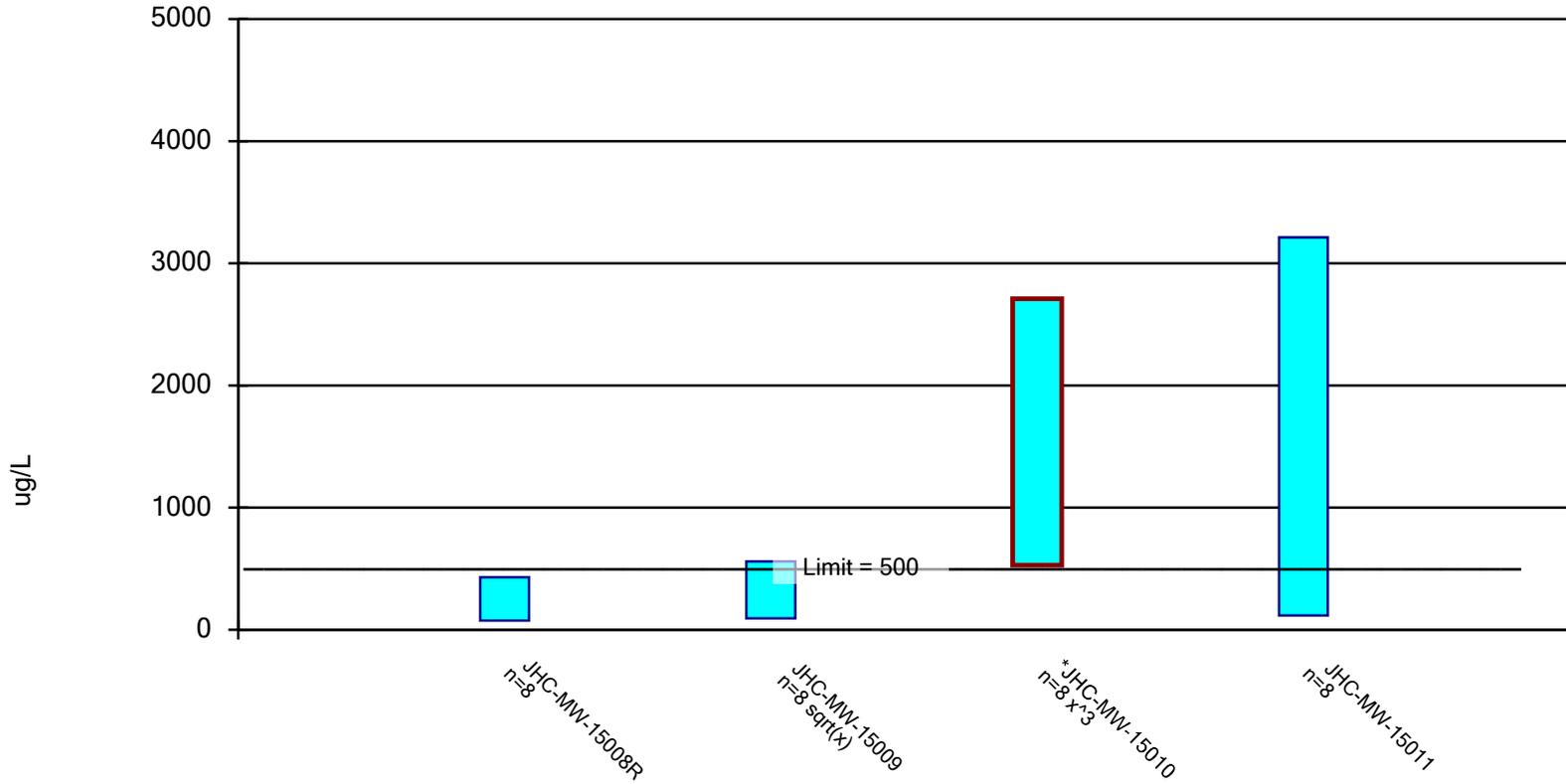


n = 5
Slope = 19.07
units per year.
Mann-Kendall
statistic = 4
critical = 10
Trend not sig-
nificant at 98%
confidence level
($\alpha = 0.01$ per
tail).

Sen's Slope Estimator Analysis Run 12/3/2020 3:31 PM
Client: Consumers Energy Data: JHC_CCR_PondA_NE_20.11.30

Parametric Confidence Interval

Compliance limit is exceeded.* Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Boron, Total Analysis Run 12/3/2020 3:36 PM
Client: Consumers Energy Data: JHC_CCR_PondA_NE_20.11.30

Confidence Interval

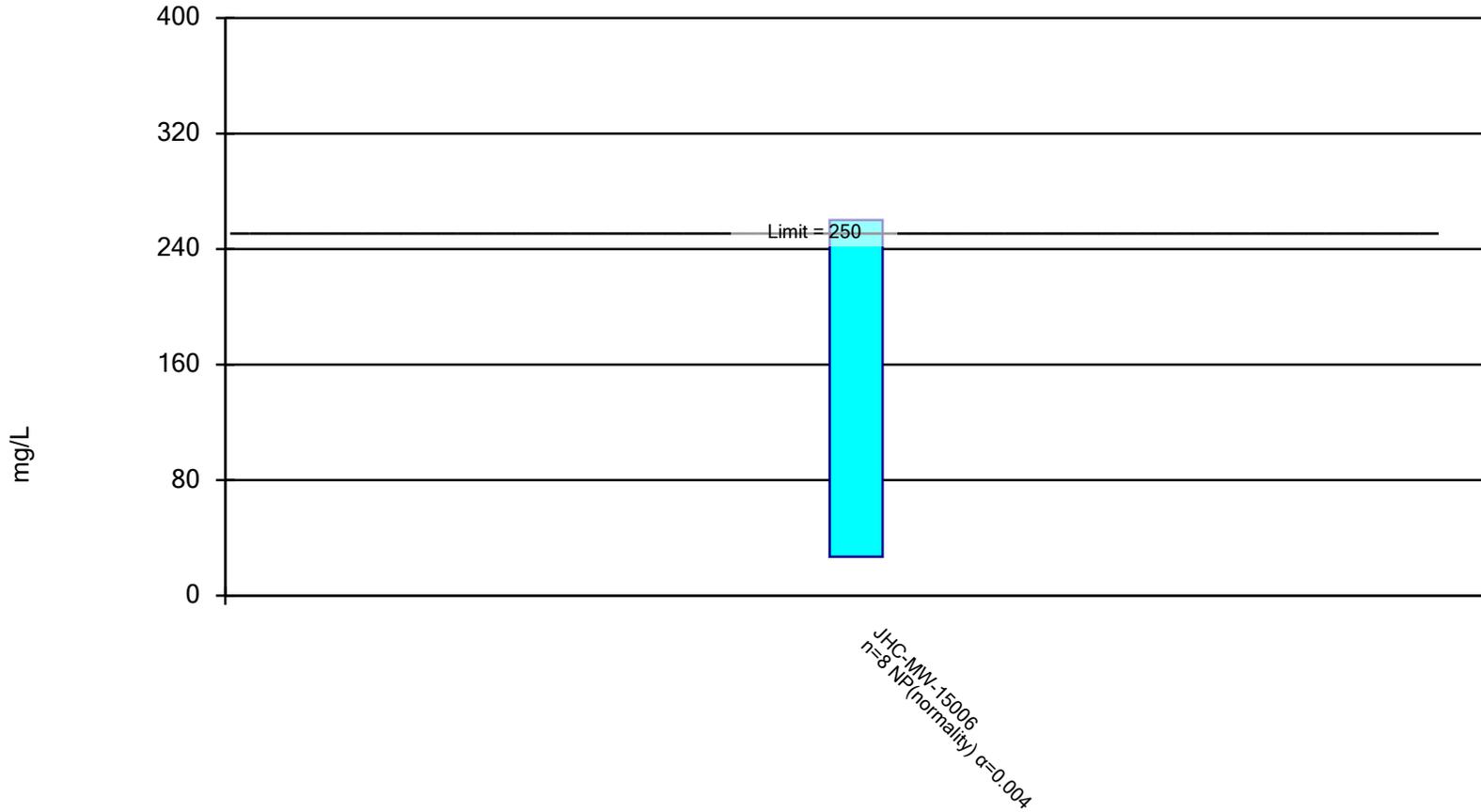
Constituent: Boron, Total (ug/L) Analysis Run 12/3/2020 3:36 PM

Client: Consumers Energy Data: JHC_CCR_PondA_NE_20.11.30

	JHC-MW-15008R	JHC-MW-15009	JHC-MW-15010	JHC-MW-15011
8/15/2017		156		
9/26/2017	116	144	109	
6/19/2018				229
6/20/2018	87.7	91.4	98.4	
11/14/2018			120	
11/15/2018		188		337
4/23/2019			2800	440
4/24/2019		200		
8/13/2019	93			
10/9/2019	130		2800	
10/10/2019				690
2/11/2020			2390	
2/12/2020	423	468		1910
4/14/2020	505	874	2350	
4/15/2020				2870
7/16/2020	384	401	2130	2720
10/22/2020	285			4120
Mean	253	315.3	1600	1665
Std. Dev.	167.9	261.1	1254	1460
Upper Lim.	431	559.9	2710	3212
Lower Lim.	74.96	92.55	528.2	116.6

Non-Parametric Confidence Interval

Compliance Limit is not exceeded.



Constituent: Sulfate Analysis Run 12/3/2020 3:34 PM
Client: Consumers Energy Data: JHC_CCR_PondA_NE_20.11.30

Confidence Interval

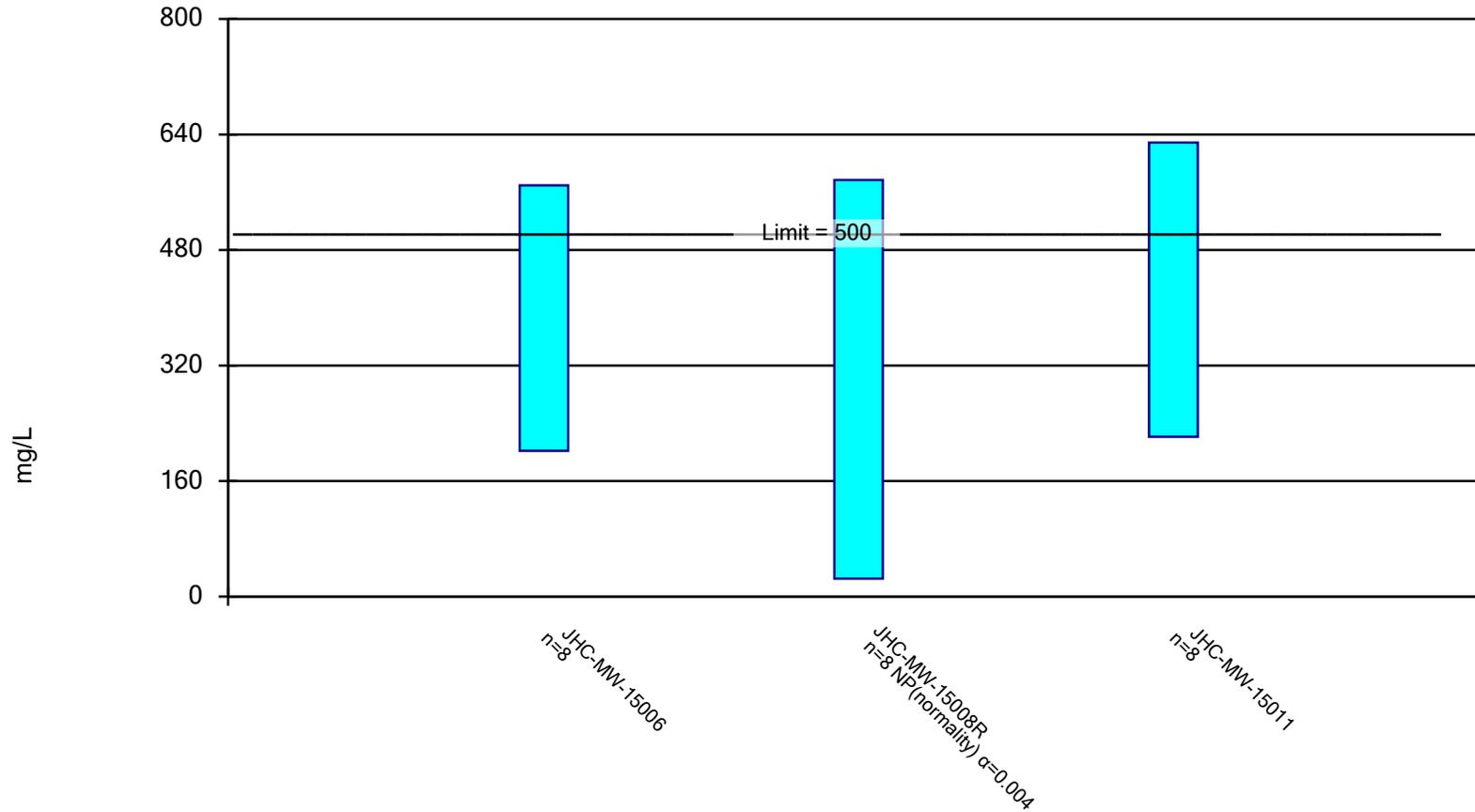
Constituent: Sulfate (mg/L) Analysis Run 12/3/2020 3:35 PM
Client: Consumers Energy Data: JHC_CCR_PondA_NE_20.11.30

JHC-MW-15006

6/20/2018	27.5
11/15/2018	27
4/24/2019	75
10/10/2019	55
2/12/2020	217
4/14/2020	260
7/16/2020	195
10/22/2020	253
Mean	138.7
Std. Dev.	102.1
Upper Lim.	260
Lower Lim.	27

Parametric and Non-Parametric (NP) Confidence Interval

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



Constituent: Total Dissolved Solids Analysis Run 12/3/2020 3:37 PM

Client: Consumers Energy Data: JHC_CCR_PondA_NE_20.11.30

Confidence Interval

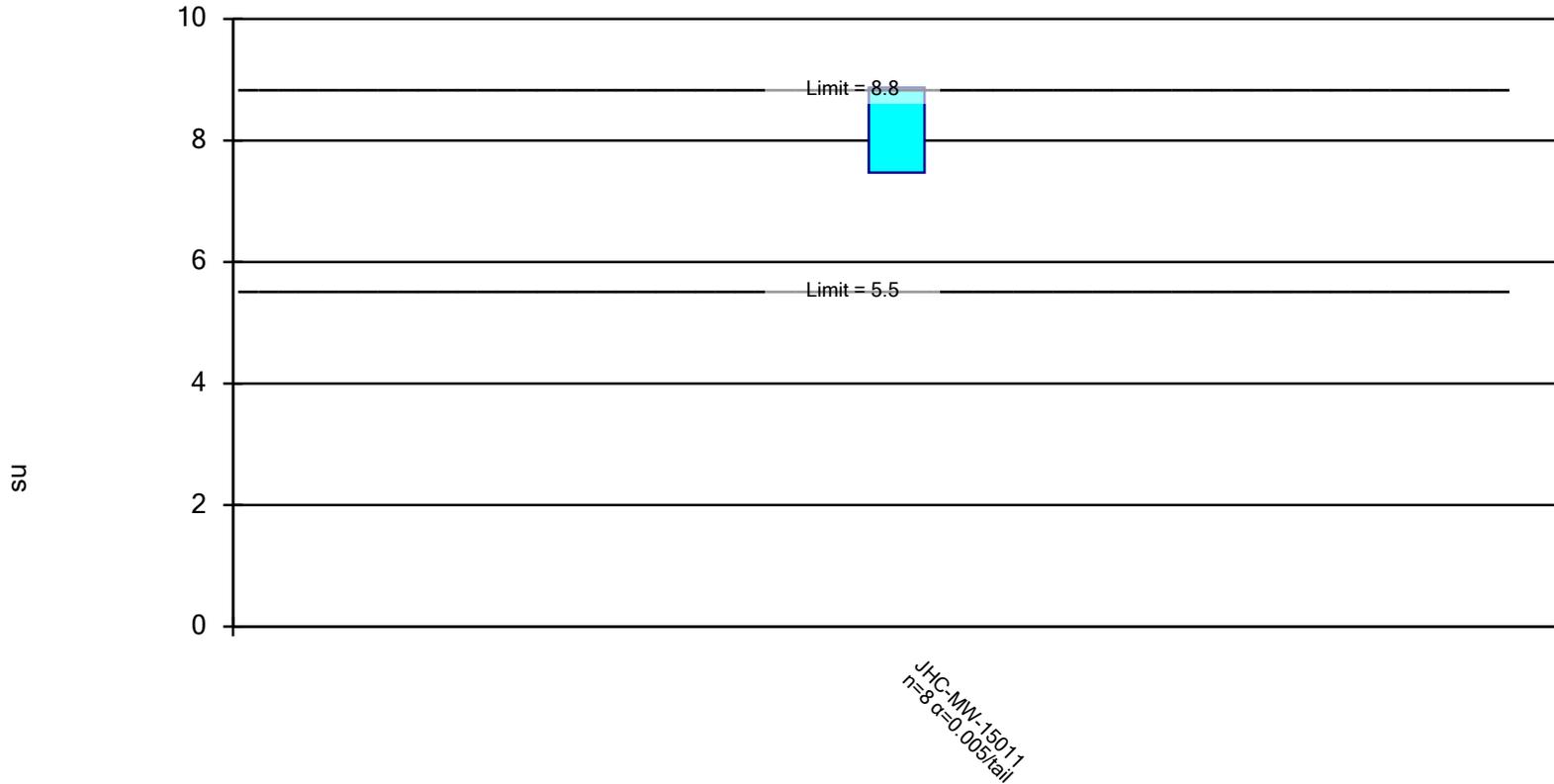
Constituent: Total Dissolved Solids (mg/L) Analysis Run 12/3/2020 3:38 PM

Client: Consumers Energy Data: JHC_CCR_PondA_NE_20.11.30

	JHC-MW-15006	JHC-MW-15008R	JHC-MW-15011
9/26/2017		190	
6/19/2018			180
6/20/2018	376	210	
11/15/2018	140		150
4/23/2019			280
4/24/2019	240		
8/13/2019		150	
10/9/2019		<50	
10/10/2019	190		550
2/12/2020	542	556	654
4/14/2020	562	566	
4/15/2020			542
7/16/2020	521	536	499
10/22/2020	515	577	546
Mean	385.8	351.3	425.1
Std. Dev.	173.4	228.7	192.2
Upper Lim.	569.6	577	628.8
Lower Lim.	201.9	25	221.4

Parametric Confidence Interval

Compliance Limit is not exceeded. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: pH, Field Analysis Run 12/3/2020 3:34 PM
Client: Consumers Energy Data: JHC_CCR_PondA_NE_20.11.30

Confidence Interval

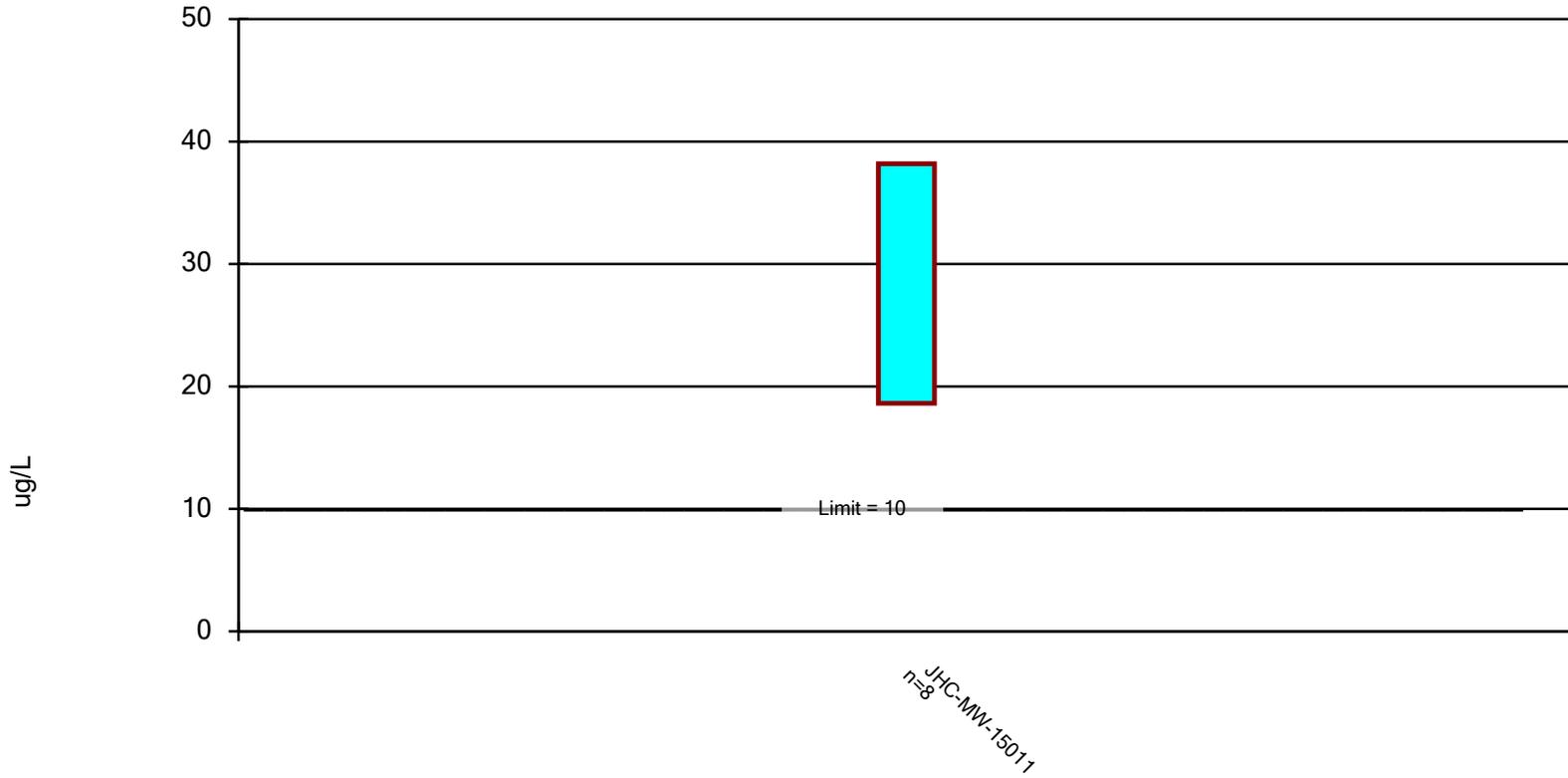
Constituent: pH, Field (su) Analysis Run 12/3/2020 3:34 PM
Client: Consumers Energy Data: JHC_CCR_PondA_NE_20.11.30

JHC-MW-15011

6/19/2018	8.12
11/15/2018	9.11
4/23/2019	8.83
10/10/2019	8.37
2/12/2020	8
4/15/2020	7.63
7/16/2020	7.7
10/22/2020	7.6
Mean	8.17
Std. Dev.	0.5642
Upper Lim.	8.868
Lower Lim.	7.472

Parametric Confidence Interval

Compliance limit is exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Arsenic, Total Analysis Run 12/3/2020 3:34 PM
Client: Consumers Energy Data: JHC_CCR_PondA_NE_20.11.30

Confidence Interval

Constituent: Arsenic, Total (ug/L) Analysis Run 12/3/2020 3:34 PM

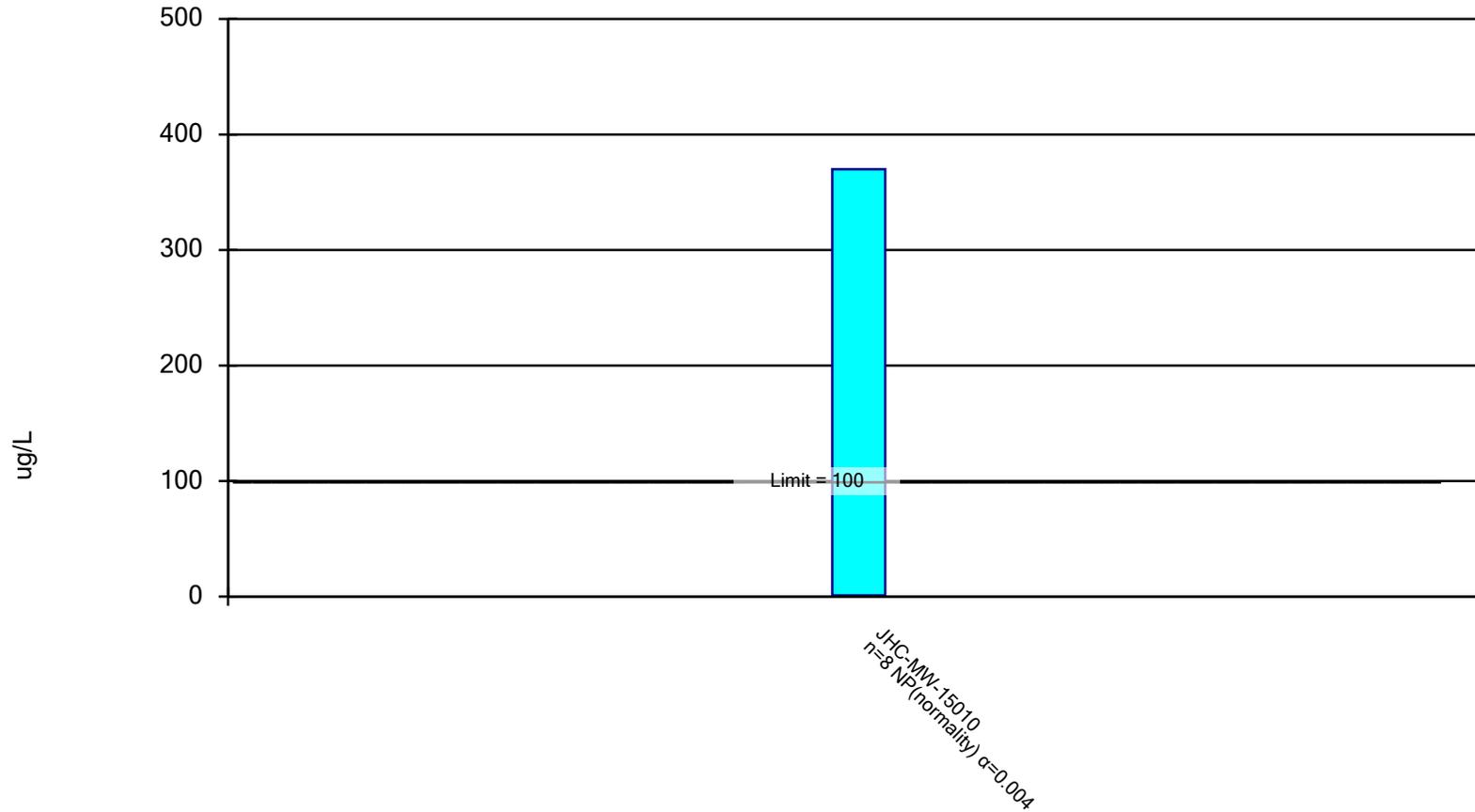
Client: Consumers Energy Data: JHC_CCR_PondA_NE_20.11.30

JHC-MW-15011

6/19/2018	15
11/15/2018	32.2
4/23/2019	36
10/10/2019	44
2/12/2020	31
4/15/2020	25
7/16/2020	22
10/22/2020	22
Mean	28.4
Std. Dev.	9.222
Upper Lim.	38.18
Lower Lim.	18.62

Non-Parametric Confidence Interval

Compliance Limit is not exceeded.



Constituent: Chromium, Total Analysis Run 12/3/2020 3:54 PM

Client: Consumers Energy Data: JHC_CCR_PondA_NE_20.11.30

Confidence Interval

Constituent: Chromium, Total (ug/L) Analysis Run 12/3/2020 3:54 PM

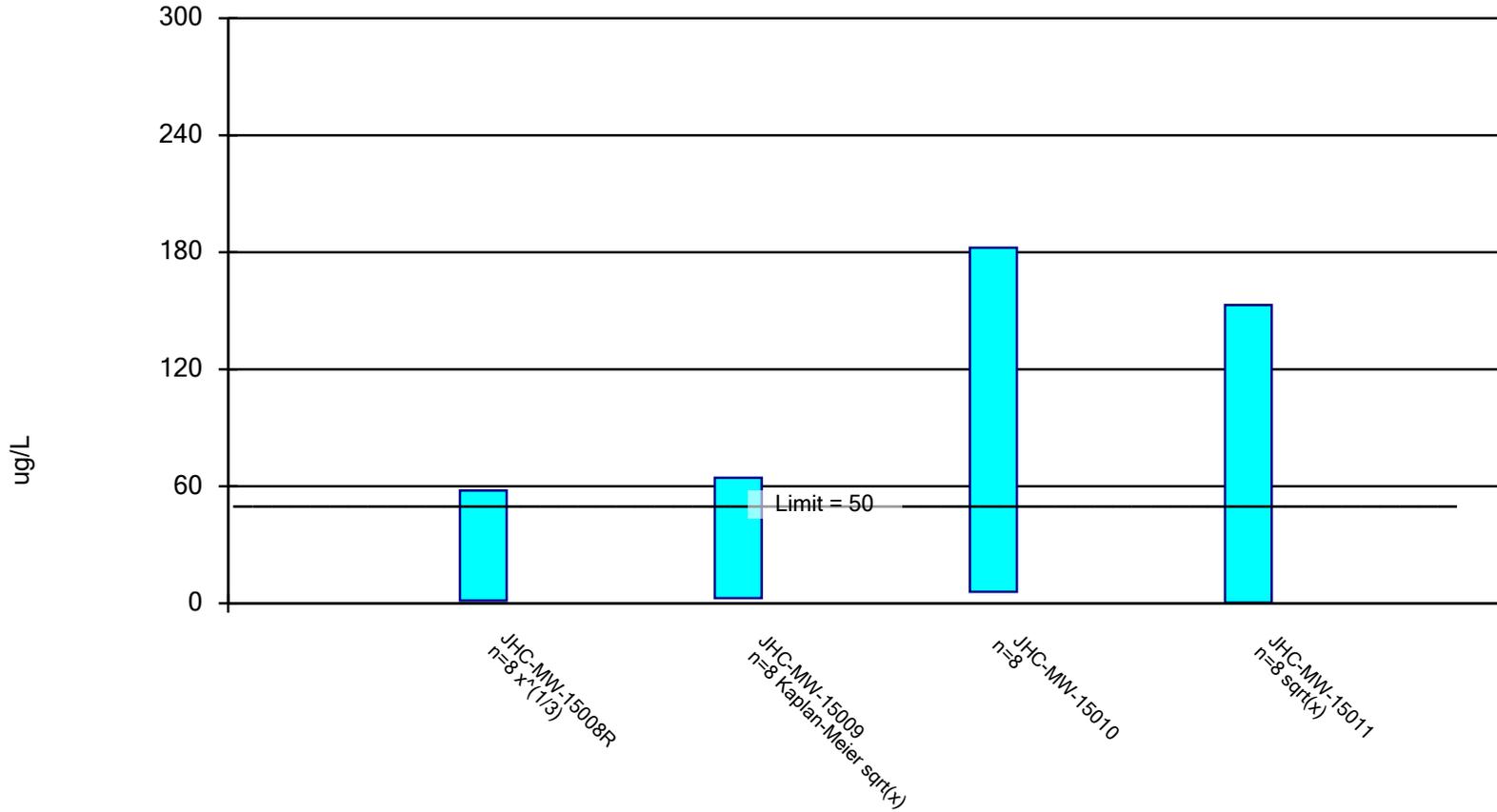
Client: Consumers Energy Data: JHC_CCR_PondA_NE_20.11.30

JHC-MW-15010

4/26/2018	1.4
6/20/2018	1.1
11/14/2018	1.5
4/23/2019	1.2
10/9/2019	370
2/11/2020	4
4/14/2020	1
7/16/2020	1
Mean	47.65
Std. Dev.	130.3
Upper Lim.	370
Lower Lim.	1

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 12/3/2020 3:38 PM
Client: Consumers Energy Data: JHC_CCR_PondA_NE_20.11.30

Confidence Interval

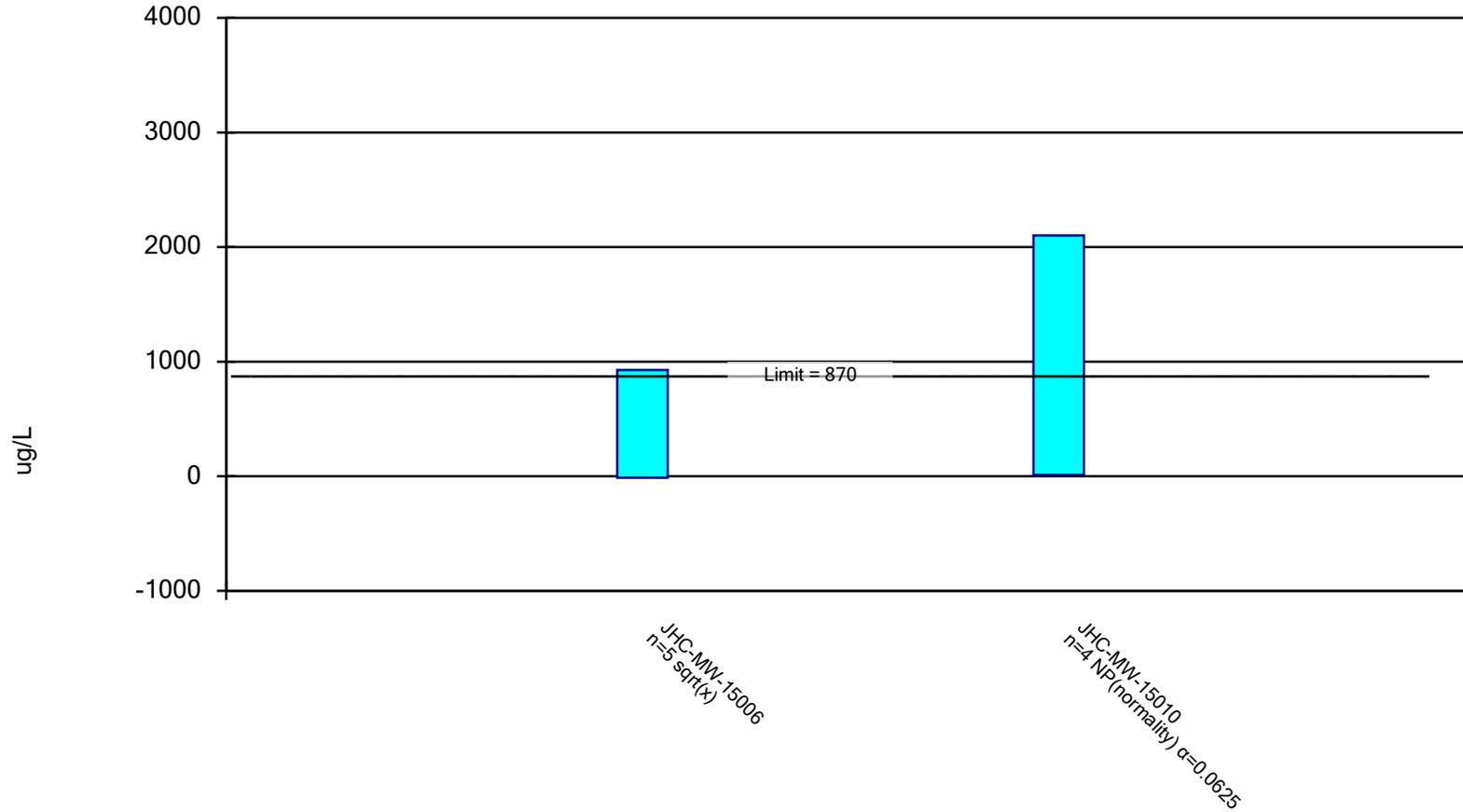
Constituent: Selenium, Total (ug/L) Analysis Run 12/3/2020 3:39 PM

Client: Consumers Energy Data: JHC_CCR_PondA_NE_20.11.30

	JHC-MW-15008R	JHC-MW-15009	JHC-MW-15010	JHC-MW-15011
8/15/2017		<1		
4/26/2018	1.7	<1	3	
6/19/2018				1.6
6/20/2018	2	10.3	11	
11/14/2018			34.1	
11/15/2018		12.6		<1
4/23/2019			32	13
4/24/2019		61		
8/13/2019	12			
10/9/2019	110		210	
10/10/2019				76
2/11/2020			126	
2/12/2020	11	20		104
4/14/2020	6	77	158	
4/15/2020				29
7/16/2020	13	76	179	20
10/22/2020	68			308
Mean	27.96	32.24	94.14	69.01
Std. Dev.	39.54	33.33	83.15	103.3
Upper Lim.	57.77	64.4	182.3	152.9
Lower Lim.	1.467	2.588	5.999	0.3697

Parametric and Non-Parametric (NP) Confidence Interval

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



Constituent: Iron, Total Analysis Run 12/3/2020 3:40 PM
Client: Consumers Energy Data: JHC_CCR_PondA_NE_20.11.30

Confidence Interval

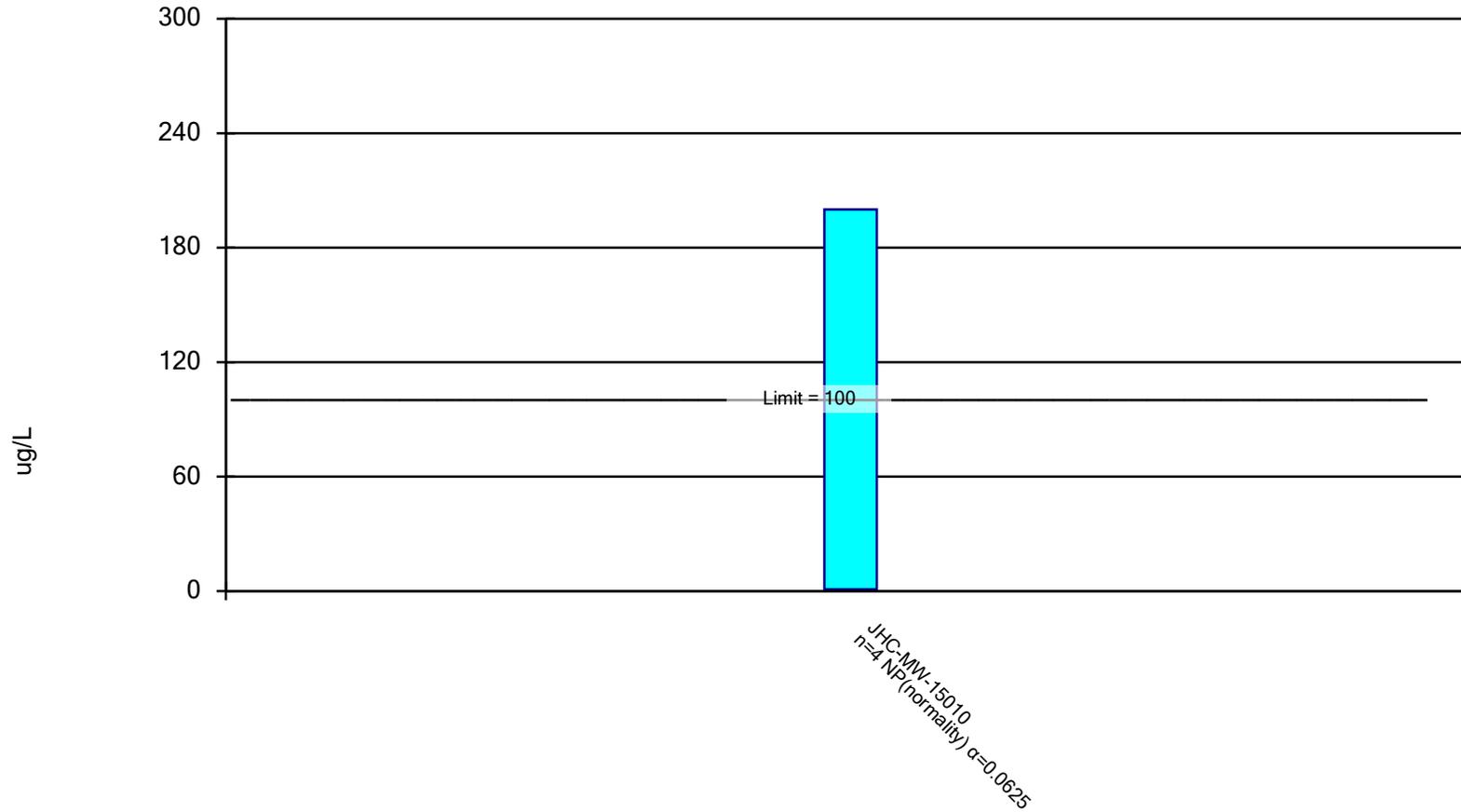
Constituent: Iron, Total (ug/L) Analysis Run 12/3/2020 3:40 PM

Client: Consumers Energy Data: JHC_CCR_PondA_NE_20.11.30

	JHC-MW-15006	JHC-MW-15010
10/9/2019		2100
10/10/2019	43	
2/11/2020		25
2/12/2020	189	
4/14/2020	26	<20
7/16/2020	128	27
10/22/2020	929	
Mean	263	540.5
Std. Dev.	378.1	1040
Upper Lim.	926.8	2100
Lower Lim.	-12.71	10

Non-Parametric Confidence Interval

Compliance Limit is not exceeded.



Constituent: Nickel, Total Analysis Run 12/3/2020 3:40 PM
Client: Consumers Energy Data: JHC_CCR_PondA_NE_20.11.30

Confidence Interval

Constituent: Nickel, Total (ug/L) Analysis Run 12/3/2020 3:40 PM

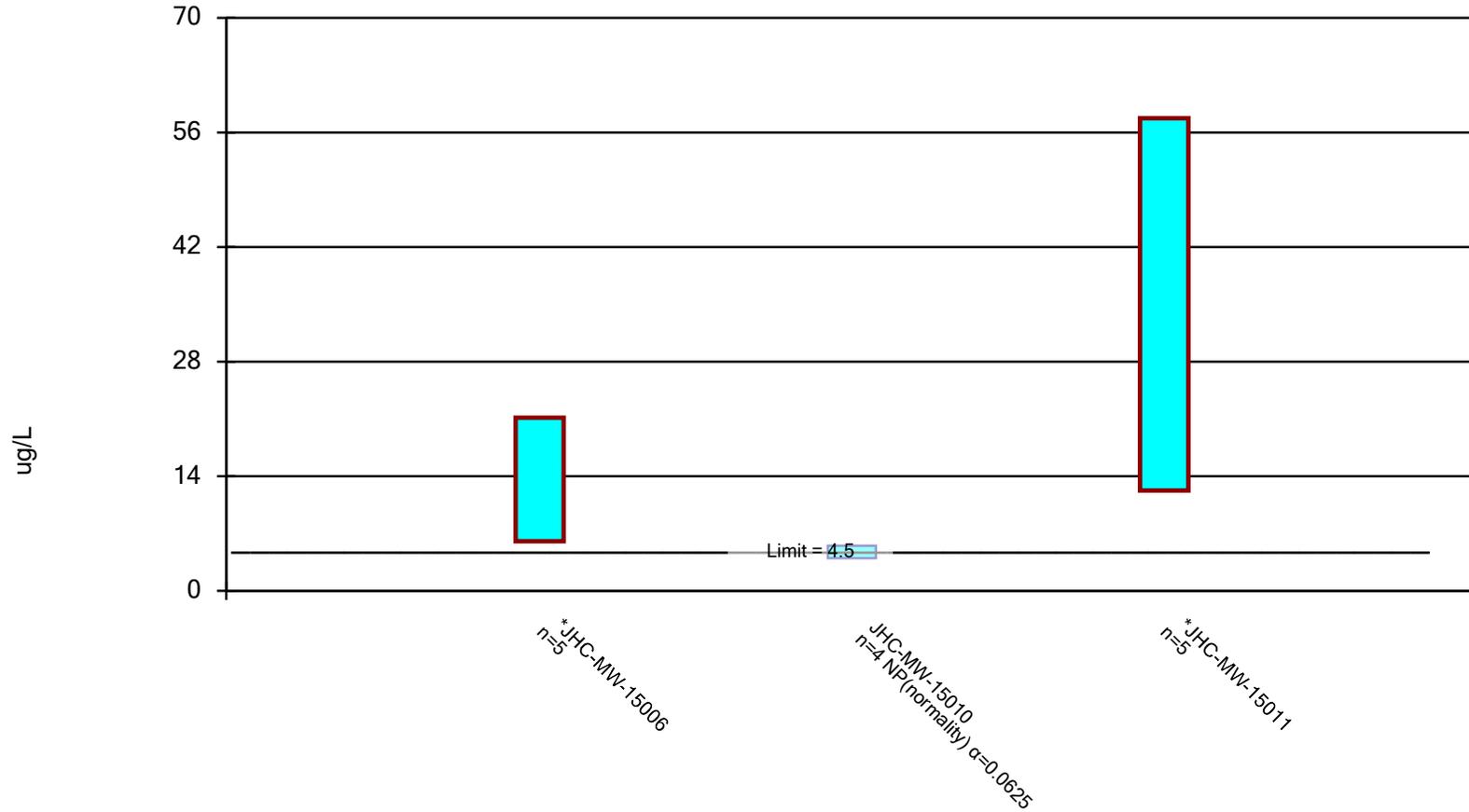
Client: Consumers Energy Data: JHC_CCR_PondA_NE_20.11.30

JHC-MW-15010

10/9/2019	200
2/11/2020	2
4/14/2020	<1
7/16/2020	<2
Mean	51.25
Std. Dev.	99.17
Upper Lim.	200
Lower Lim.	1

Parametric and Non-Parametric (NP) Confidence Interval

Compliance limit is exceeded.* Per-well alpha = 0.01 except as noted. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Vanadium, Total Analysis Run 12/3/2020 3:40 PM

Client: Consumers Energy Data: JHC_CCR_PondA_NE_20.11.30

Confidence Interval

Constituent: Vanadium, Total (ug/L) Analysis Run 12/3/2020 3:40 PM

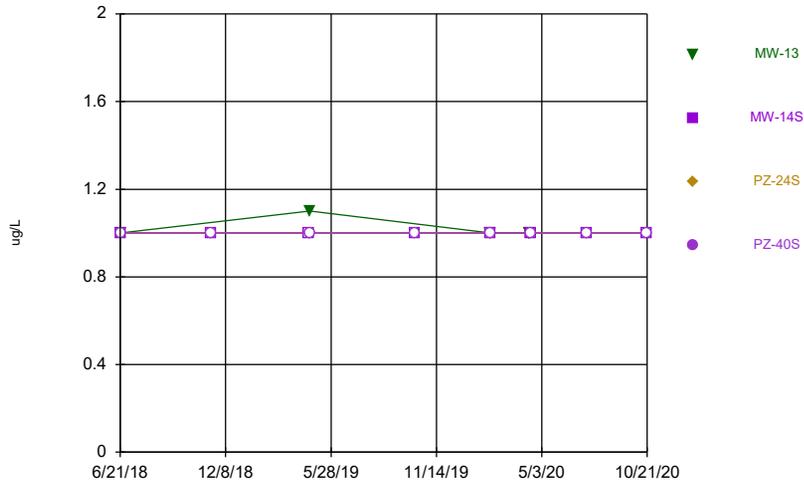
Client: Consumers Energy Data: JHC_CCR_PondA_NE_20.11.30

	JHC-MW-15006	JHC-MW-15010	JHC-MW-15011
10/9/2019		5.5	
10/10/2019	8		14
2/11/2020		4	
2/12/2020	16		42
4/14/2020	10	4	
4/15/2020			40
7/16/2020	15	4	30
10/22/2020	19		49
Mean	13.6	4.375	35
Std. Dev.	4.506	0.75	13.56
Upper Lim.	21.15	5.5	57.73
Lower Lim.	6.05	4	12.27

Appendix C

GSI Time Series Charts

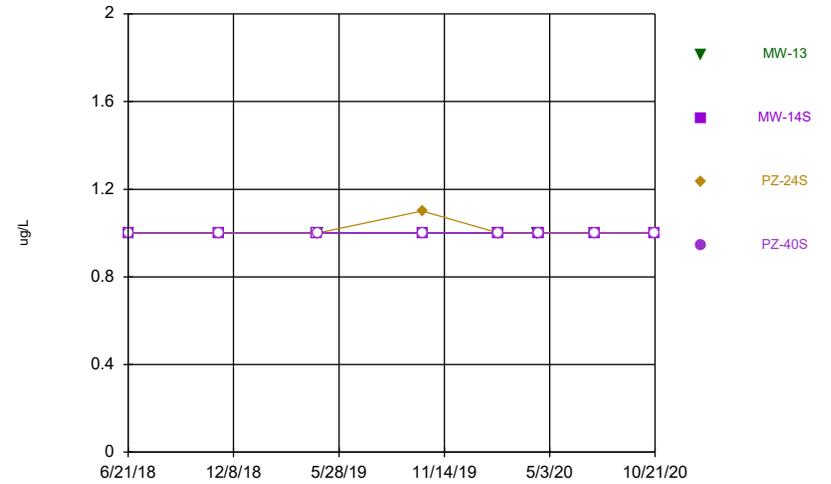
Antimony, Total



Time Series Analysis Run 1/18/2021 1:52 PM
Client: Consumers Energy Data: JHC_CCR_PondA_NE_20.11.30

Insufficient amount of groundwater present in February and April 2020 to collect sample for total metals for MW-13. Reported February and April 2020 result is dissolved antimony result collected in accordance with the JH Campbell Dry Ash Landfill Hydrogeological Monitoring Plan (HMP).

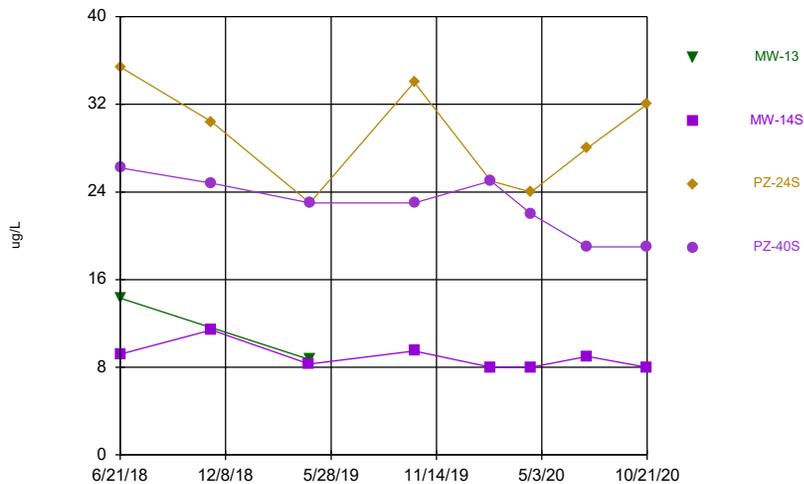
Arsenic, Total



Time Series Analysis Run 1/18/2021 1:52 PM
Client: Consumers Energy Data: JHC_CCR_PondA_NE_20.11.30

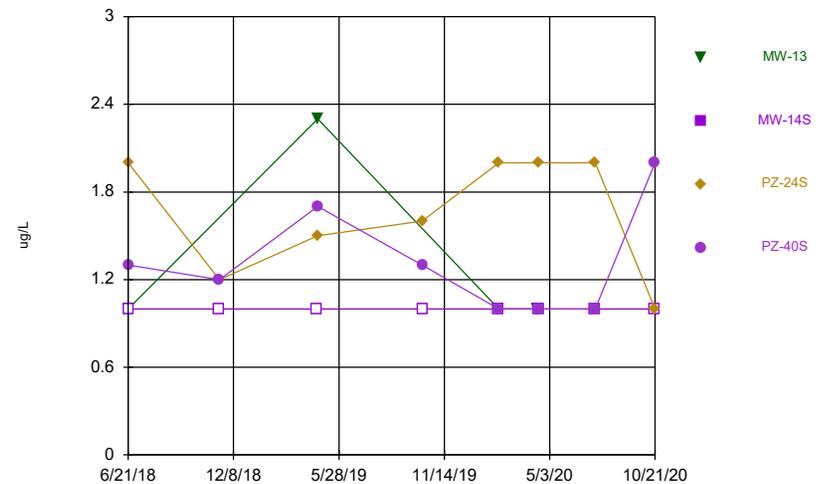
Insufficient amount of groundwater present in February and April 2020 to collect sample for total metals for MW-13. Reported February and April 2020 result is dissolved arsenic result collected in accordance with the JH Campbell Dry Ash Landfill Hydrogeological Monitoring Plan (HMP).

Barium, Total



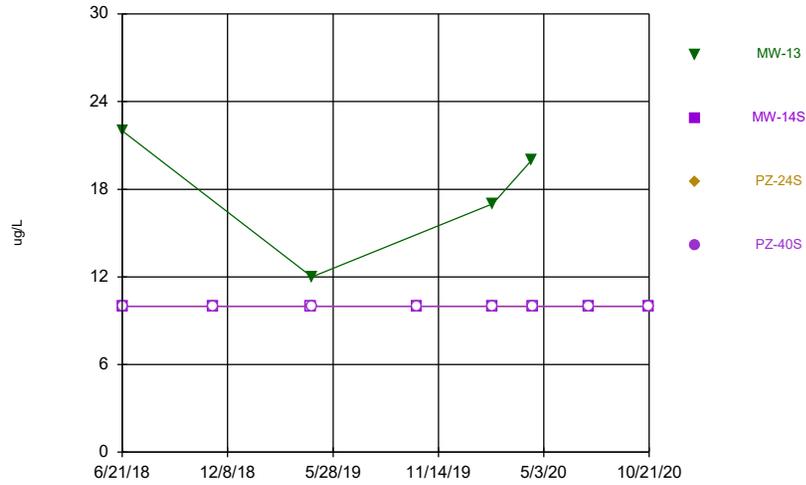
Time Series Analysis Run 1/18/2021 1:52 PM
Client: Consumers Energy Data: JHC_CCR_PondA_NE_20.11.30

Chromium, Total



Insufficient amount of groundwater present in February and April 2020 to collect sample for total metals for MW-13. Reported February and April 2020 result is dissolved chromium result collected in accordance with the JH Campbell Dry Ash Landfill Hydrogeological Monitoring Plan (HMP).

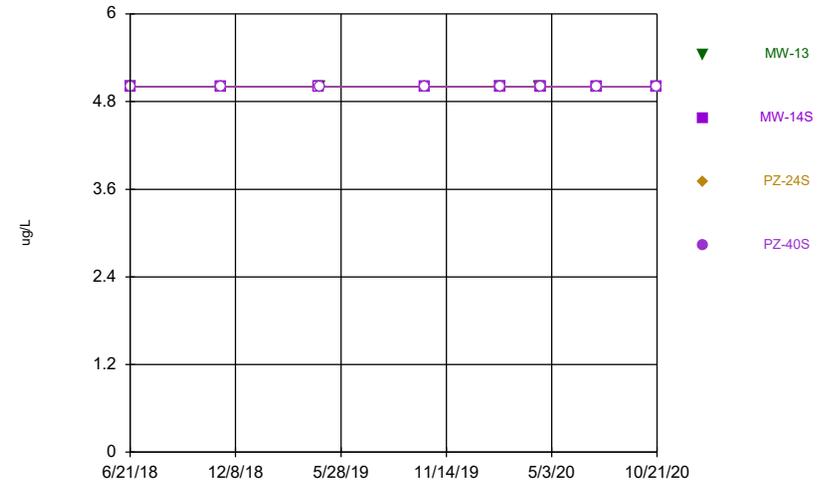
Lithium, Total



Time Series Analysis Run 1/18/2021 1:52 PM
Client: Consumers Energy Data: JHC_CCR_PondA_NE_20.11.30

Insufficient amount of groundwater present in February and April 2020 to collect sample for total metals for MW-13. Reported February and April 2020 result is dissolved lithium result collected in accordance with the JH Campbell Dry Ash Landfill Hydrogeological Monitoring Plan (HMP).

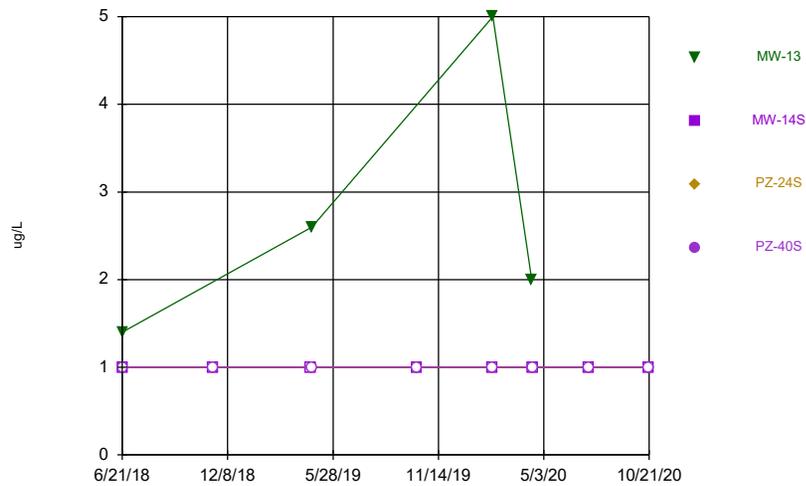
Molybdenum, Total



Time Series Analysis Run 1/18/2021 1:52 PM
Client: Consumers Energy Data: JHC_CCR_PondA_NE_20.11.30

Insufficient amount of groundwater present in February and April 2020 to collect sample for total metals for MW-13. Reported February and April 2020 result is dissolved molybdenum result collected in accordance with the JH Campbell Dry Ash Landfill Hydrogeological Monitoring Plan (HMP).

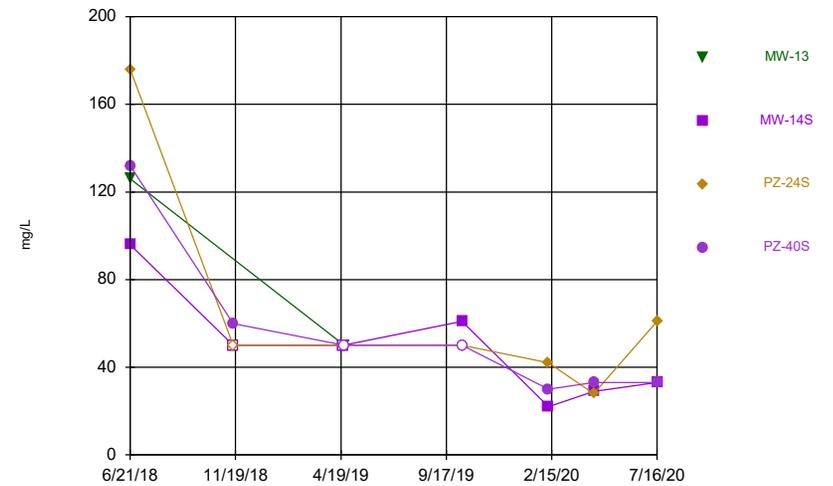
Selenium, Total



Time Series Analysis Run 1/18/2021 1:52 PM
Client: Consumers Energy Data: JHC_CCR_PondA_NE_20.11.30

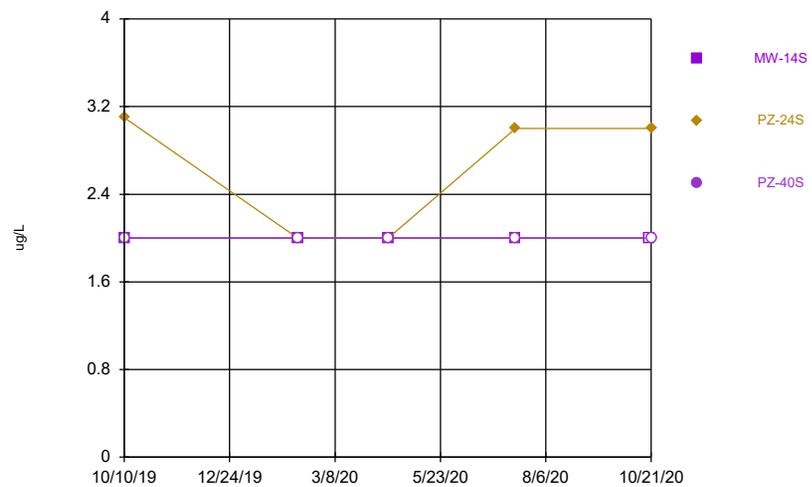
Insufficient amount of groundwater present in February and April 2020 to collect sample for total metals for MW-13. Reported February and April 2020 result is dissolved selenium result collected in accordance with the JH Campbell Dry Ash Landfill Hydrogeological Monitoring Plan (HMP).

Total Dissolved Solids



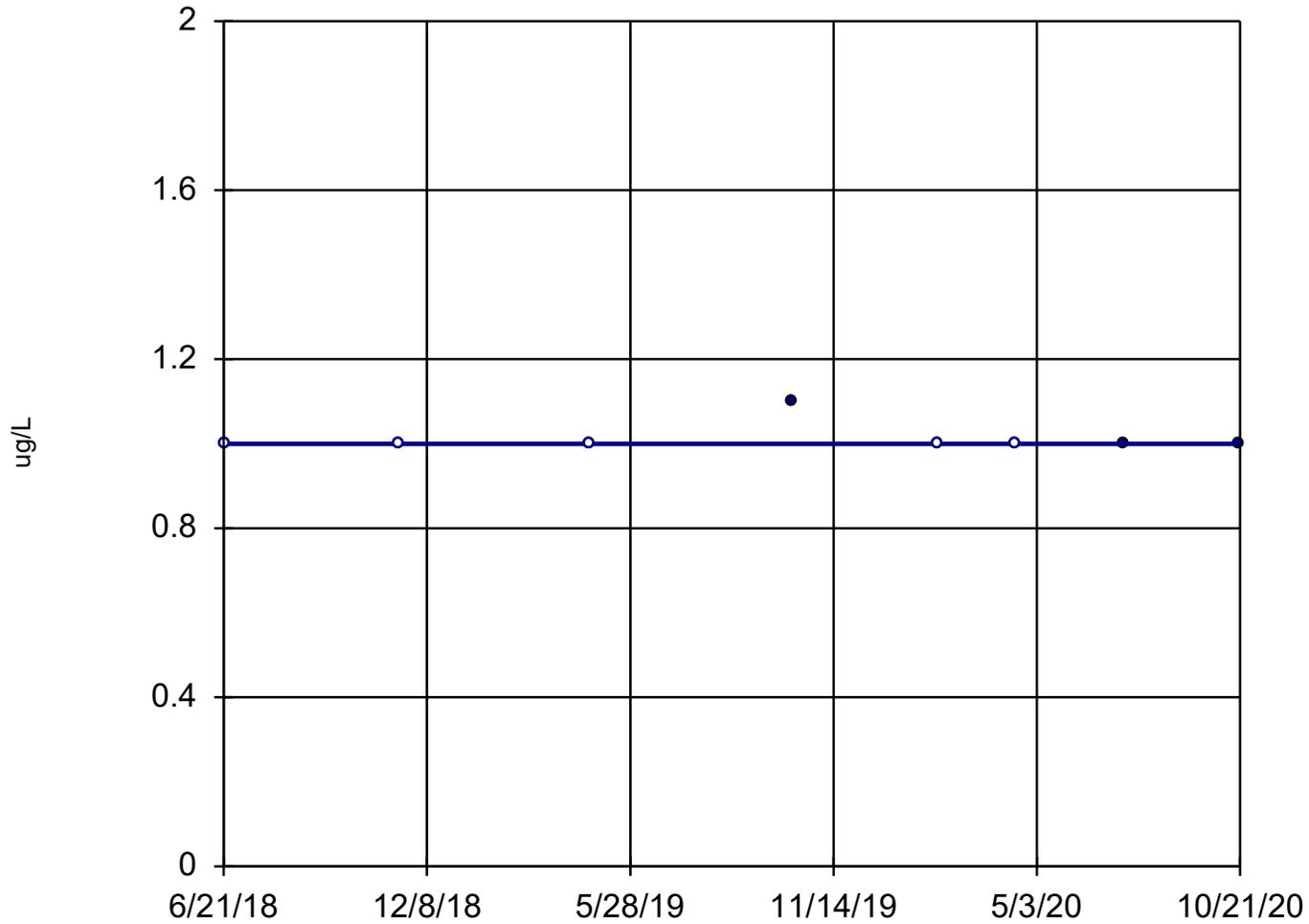
Time Series Analysis Run 1/18/2021 1:52 PM
Client: Consumers Energy Data: JHC_CCR_PondA_NE_20.11.30

Vanadium, Total



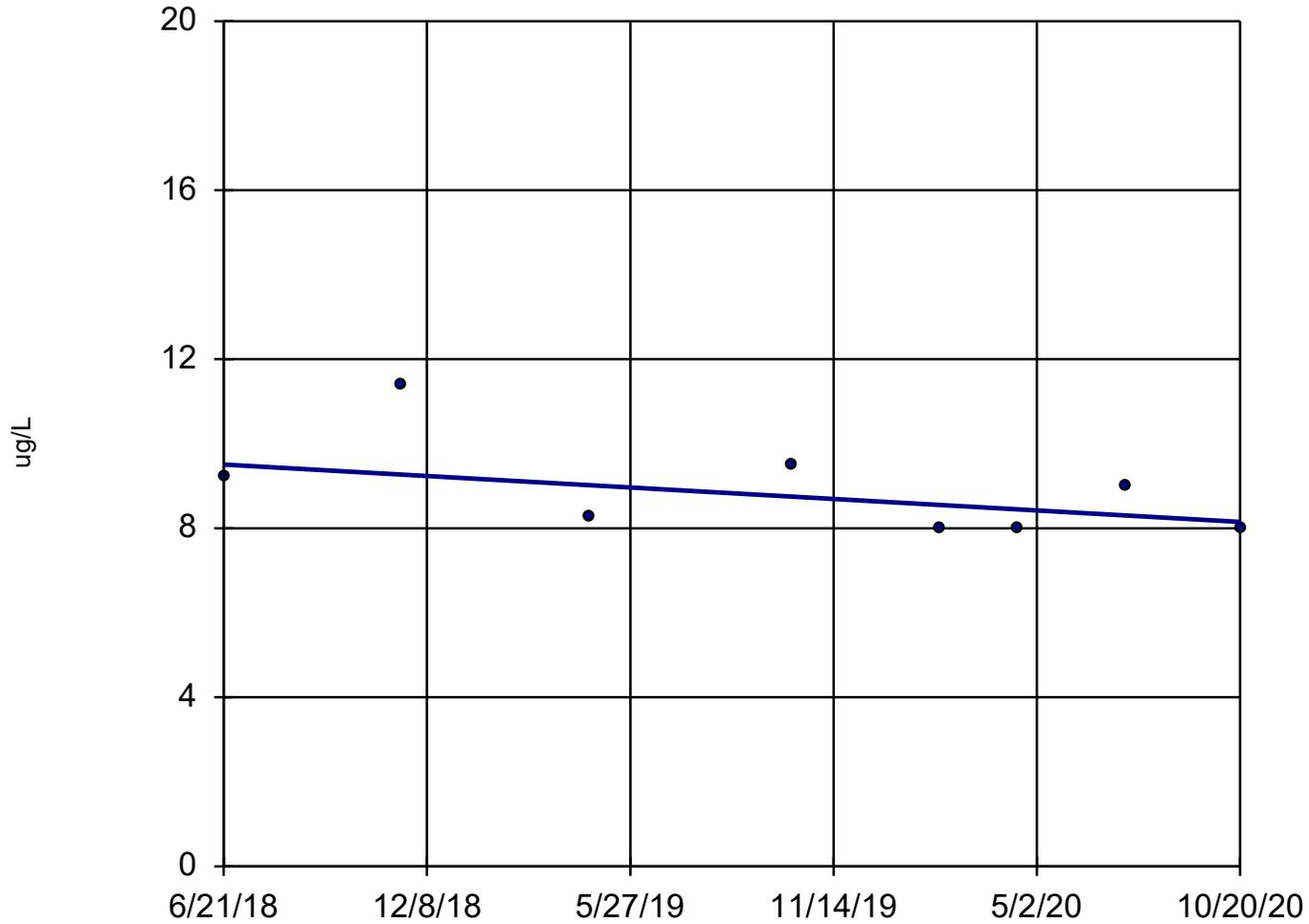
Time Series Analysis Run 1/18/2021 1:52 PM
Client: Consumers Energy Data: JHC_CCR_PondA_NE_20.11.30

Arsenic, Total PZ-24S



n = 8
Slope = 0
units per year.
Mann-Kendall
statistic = -1
critical = -20
Trend not sig-
nificant at 98%
confidence level
($\alpha = 0.01$ per
tail).

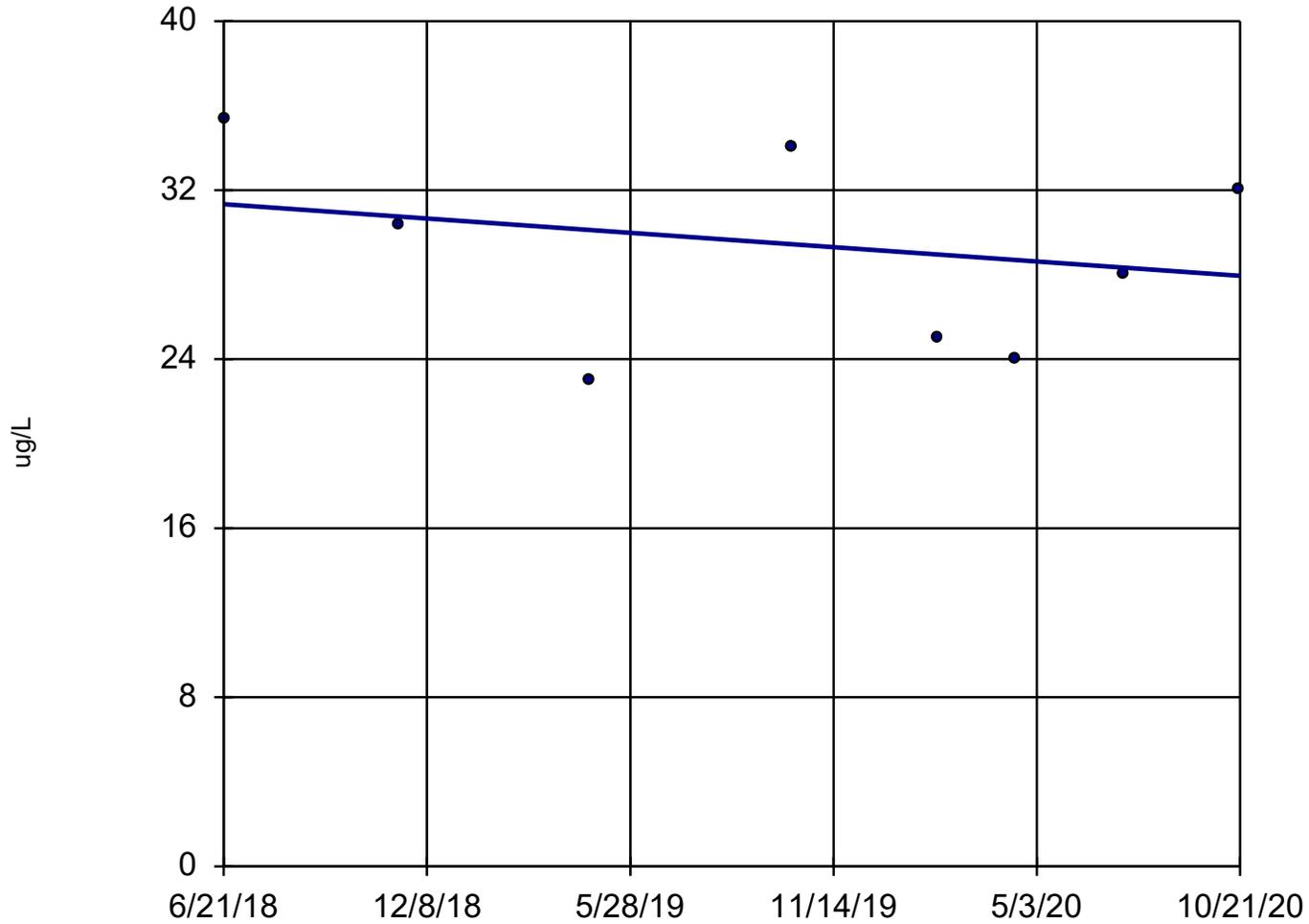
Barium, Total MW-14S



n = 8
Slope = -0.5829
units per year.
Mann-Kendall
statistic = -13
critical = -20
Trend not sig-
nificant at 98%
confidence level
($\alpha = 0.01$ per
tail).

Sen's Slope Estimator Analysis Run 12/16/2020 9:55 AM
Client: Consumers Energy Data: JHC_CCR_PondA_NE_20.11.30

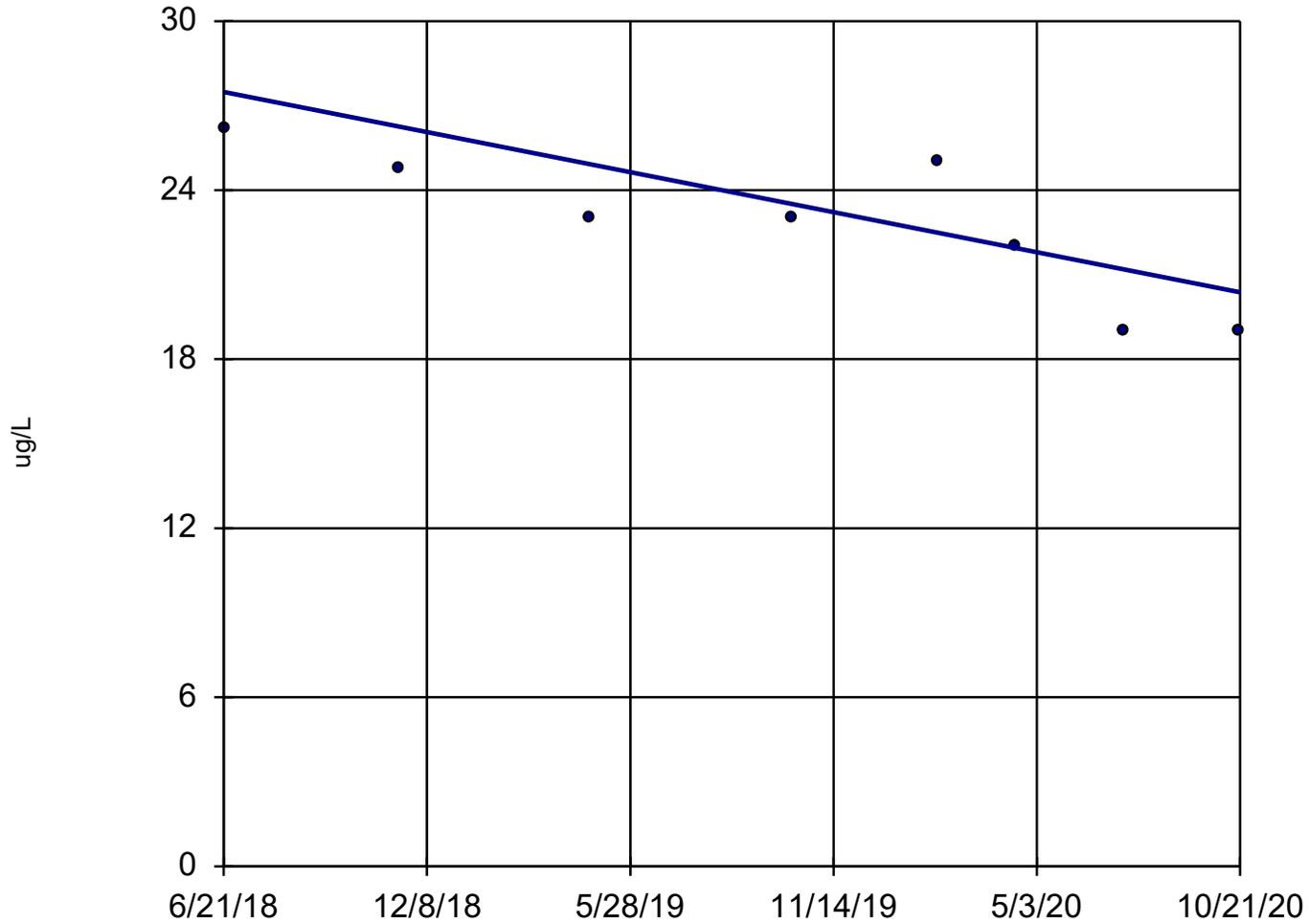
Barium, Total PZ-24S



n = 8
Slope = -1.448
units per year.
Mann-Kendall
statistic = -4
critical = -20
Trend not sig-
nificant at 98%
confidence level
($\alpha = 0.01$ per
tail).

Sen's Slope Estimator Analysis Run 12/16/2020 9:55 AM
Client: Consumers Energy Data: JHC_CCR_PondA_NE_20.11.30

Barium, Total PZ-40S

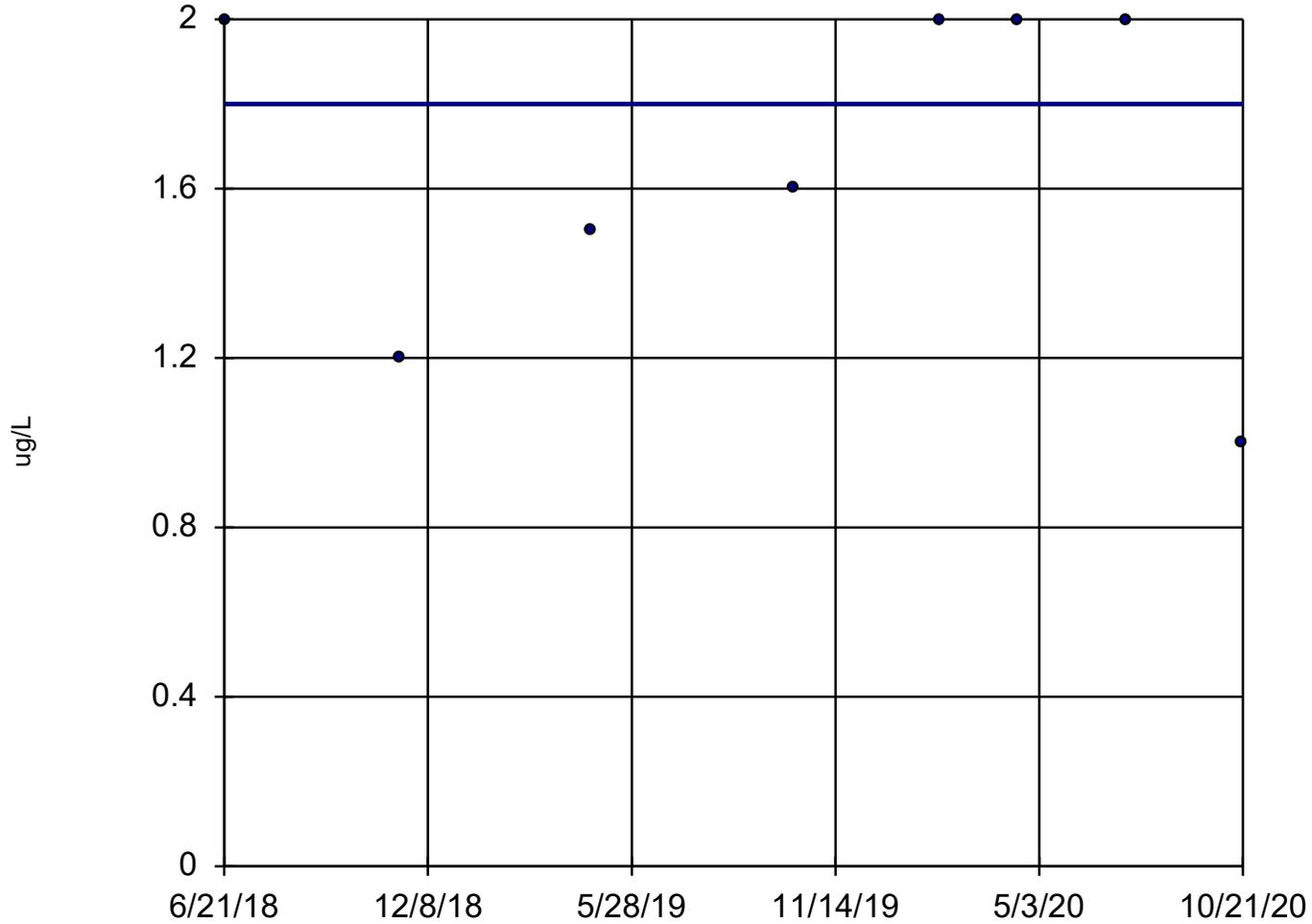


n = 8
Slope = -3.042
units per year.
Mann-Kendall
statistic = -20
critical = -20
Trend not sig-
nificant at 98%
confidence level
($\alpha = 0.01$ per
tail).

Sen's Slope Estimator Analysis Run 12/16/2020 9:55 AM
Client: Consumers Energy Data: JHC_CCR_PondA_NE_20.11.30

Chromium, Total

PZ-24S

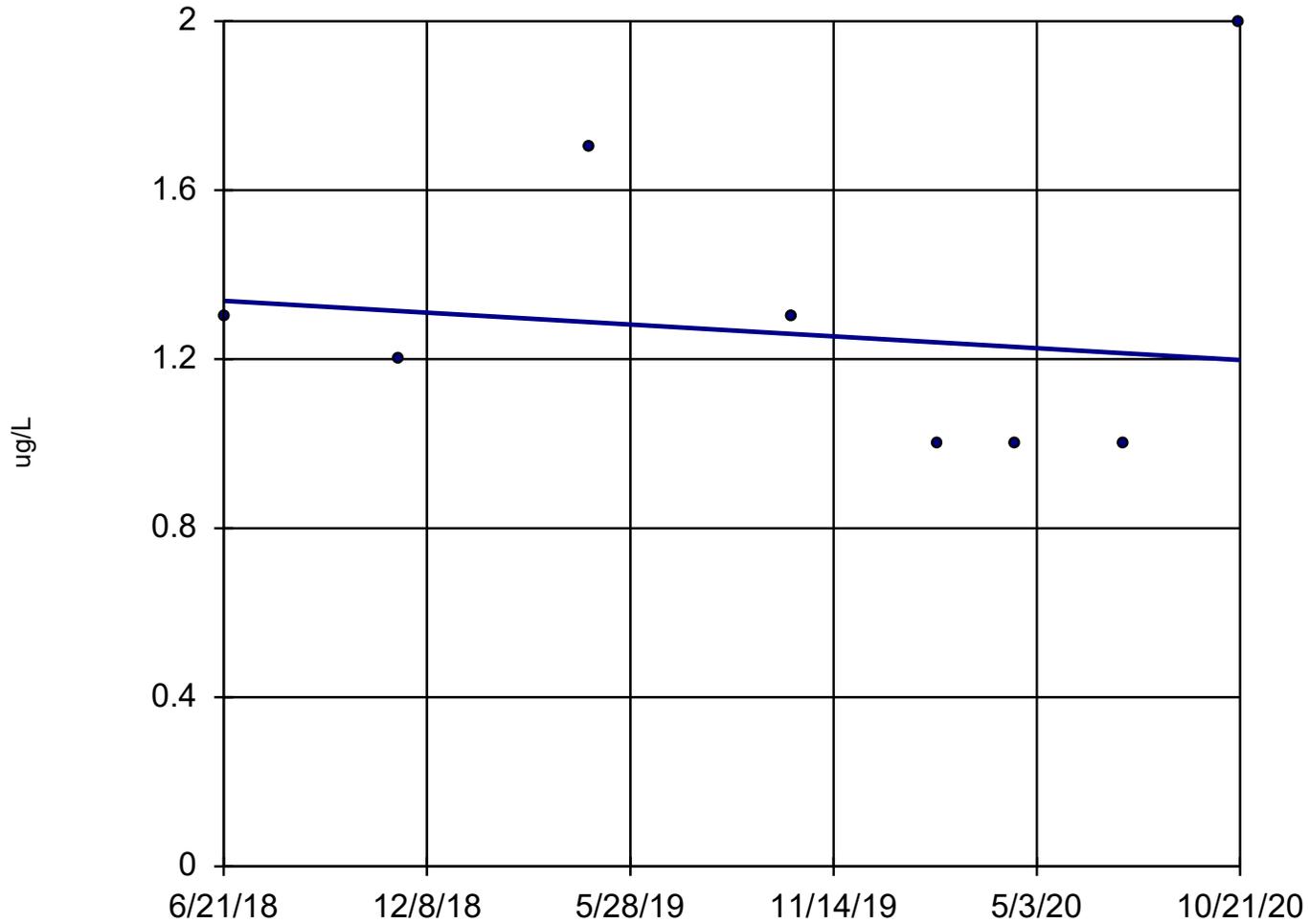


n = 8
Slope = 0
units per year.
Mann-Kendall
statistic = 2
critical = 20
Trend not sig-
nificant at 98%
confidence level
($\alpha = 0.01$ per
tail).

Sen's Slope Estimator Analysis Run 12/16/2020 9:55 AM
Client: Consumers Energy Data: JHC_CCR_PondA_NE_20.11.30

Chromium, Total

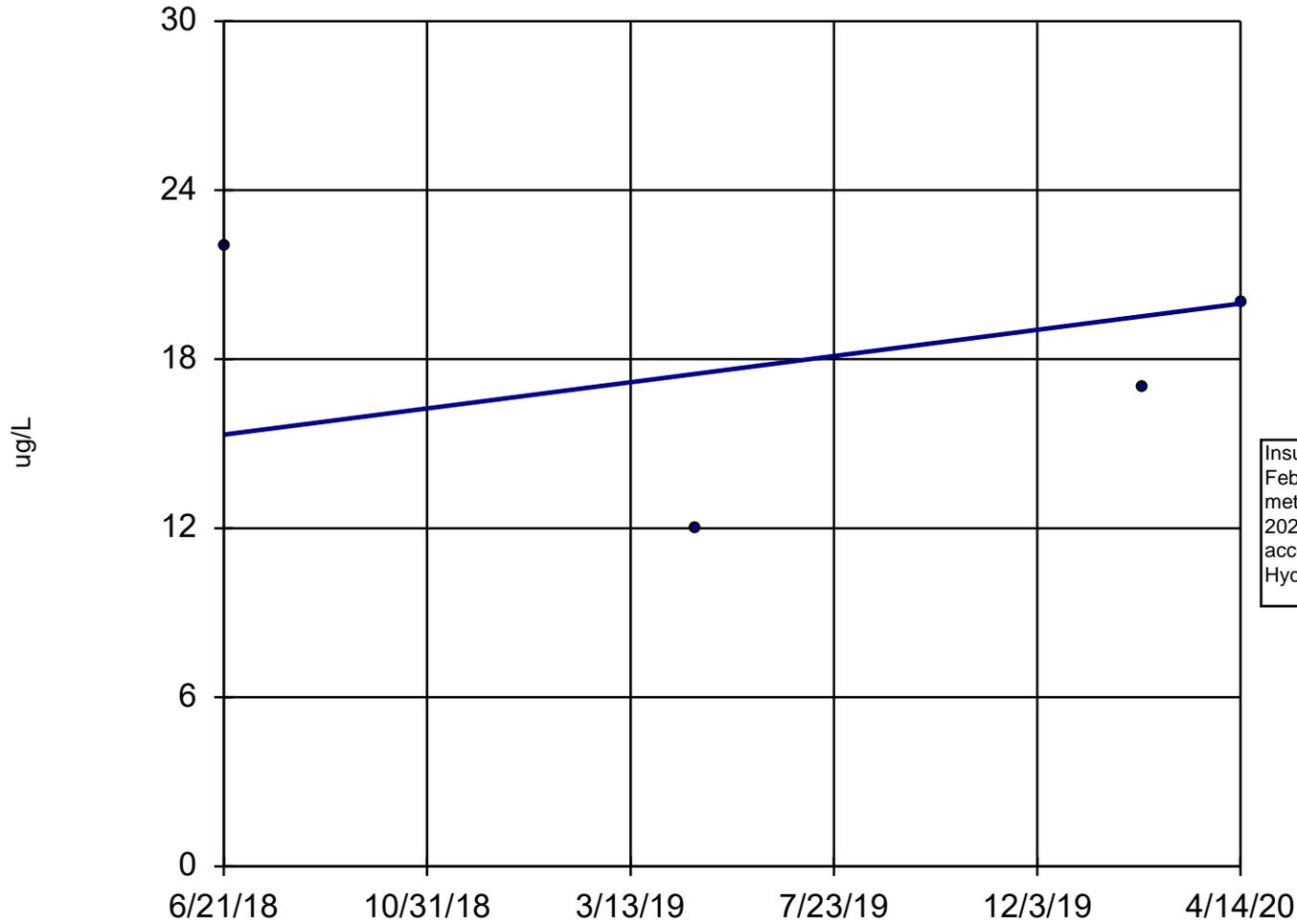
PZ-40S



n = 8
Slope = -0.06003
units per year.
Mann-Kendall
statistic = -4
critical = -20
Trend not sig-
nificant at 98%
confidence level
($\alpha = 0.01$ per
tail).

Sen's Slope Estimator Analysis Run 12/16/2020 9:55 AM
Client: Consumers Energy Data: JHC_CCR_PondA_NE_20.11.30

Lithium, Total MW-13

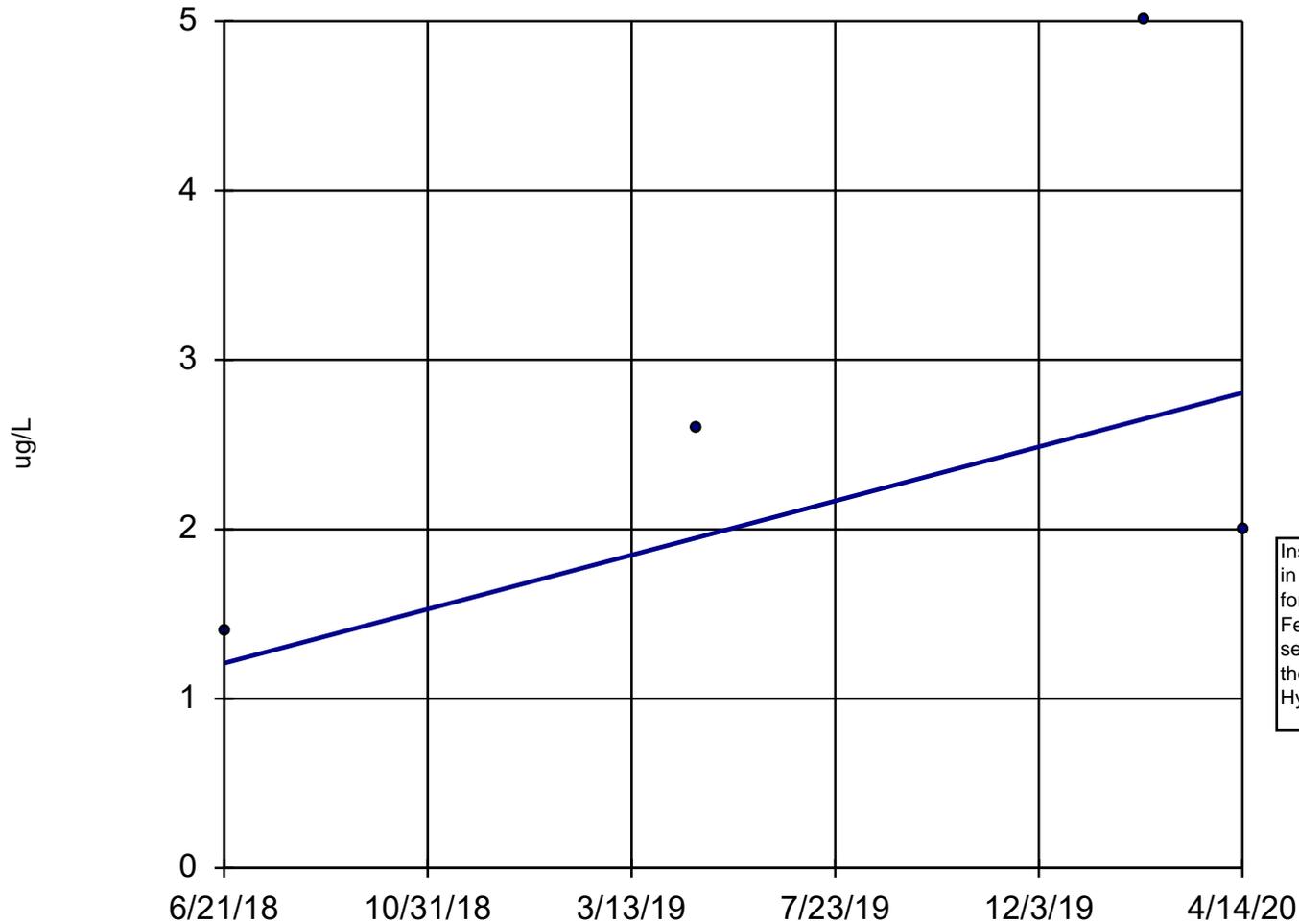


n = 4
Slope = 2.564
units per year.
Mann-Kendall
statistic = 0
critical = 8
Trend not sig-
nificant at 98%
confidence level
($\alpha = 0.01$ per
tail).

Insufficient amount of groundwater present in February and April 2020 to collect sample for total metals for MW-13. Reported February and April 2020 result is dissolved lithium result collected in accordance with the JH Campbell Dry Ash Landfill Hydrogeological Monitoring Plan (HMP).

Sen's Slope Estimator Analysis Run 12/16/2020 9:55 AM
Client: Consumers Energy Data: JHC_CCR_PondA_NE_20.11.30

Selenium, Total MW-13



n = 4
Slope = 0.8785
units per year.

Mann-Kendall
statistic = 2
critical = 8

Trend not sig-
nificant at 98%
confidence level
($\alpha = 0.01$ per
tail).

With n = 4, no data
set will result in
a significant Mann-
Kendall statistic.

Insufficient amount of groundwater present in February and April 2020 to collect sample for total metals for MW-13. Reported February and April 2020 result is dissolved selenium result collected in accordance with the JH Campbell Dry Ash Landfill Hydrogeological Monitoring Plan (HMP).

Sen's Slope Estimator Analysis Run 12/16/2020 9:55 AM
Client: Consumers Energy Data: JHC_CCR_PondA_NE_20.11.30

Appendix D

October 2020 Laboratory Reports

To: CDBatts, JH Campbell Complex

From: EBlaj, T-258

Date: November 11, 2020

Subject: JH CAMPBELL SOLID WASTE DISPOSAL AREA – GROUNDWATER MONITORING
4th Quarter, 2020 – Background Wells

CC: BLSwanberg, P22-119
BTRunkel, P22-120
HDRegister, P22-521

Sarah Holmstrom, Project Manager
TRC Companies, Inc.
1540 Eisenhower Place
Ann Arbor, MI 48108

Chemistry Project: 20-1192

CE Laboratory Services conducted groundwater monitoring on 10/20/2020 at the JH Campbell Solid Waste Disposal Area, for the 4th Quarter monitoring requirements. The samples were received for analysis by the Chemistry department on 10/22/2020.

Samples for Radium analysis have been subcontracted to Eurofins/TestAmerica, Inc. and their results are being reported separately. Please note that the subcontracted work is not reported under the CE laboratory scope of accreditation.

With the exception noted above, the report that follows presents the results of the requested analytical testing; the results apply only to the samples, as received. All samples have been analyzed in accordance with the 2016 TNI Standard and the applicable A2LA accreditation scope for Laboratory Services. Any exceptions to applicable test method criteria and standard compliance are noted in the Case Narrative, or flagged with applicable qualifiers in the analytical results section.

Reviewed and approved by:

Emil Blaj
Sr. Technical Analyst
Project Lead



Testing performed in accordance with the A2LA scope of accreditation specified in the listed certificate. The information contained in this report is the sole property of Consumers Energy. It cannot be reproduced except in full, and with consent from Consumers Energy, or the customer for which this report was issued.

CASE NARRATIVE

I. Sample Receipt

All samples were received within hold time and in good conditions; no anomalies were noted on the Sample Log-In Shipment Inspection Form during sample check-in. Identification of all samples included in the work order/project is provided in the sample summary section. Sample preservation upon receipt was verified by the sample custodian and confirmed to meet method requirements.

II. Methodology

Unless otherwise indicated, sample preparation and analysis was performed in accordance with the corresponding test methods from “Methods for the Determination of Inorganic Substances in Environmental Samples (EPA/600/R-93/100); SW-846, “Test Methods for Evaluating Solid Waste – Physical/Chemical Methods”, USEPA (latest revisions), and Standard Methods for the Examination of Water and Wastewater, APHA-AWWA-WPCF, 22nd Edition, 2012.

III. Results/Quality Control

Analytical results for this report are presented by laboratory sample ID, container & aliquot number. Results for the field blanks, field duplicates, and percent recoveries of the field matrix spike & matrix spike duplicate samples are included in the results section. Unless specifically noted in the case narrative, all method quality control requirements have been met. If any results are qualified, the corresponding data flags/qualifiers are listed on the last page of the results section. Any additional information on method performance, when applicable, is presented in this section of the case narrative. When data flags are not needed, the qualifiers text box on the last page is left blank, and a statement confirms that no exceptions occurred.

DEFINITIONS / QUALIFIERS

The following qualifiers and/or acronyms are used in the report where applicable:

<u>Acronym</u>	<u>Description</u>
RL	Reporting Limit
ND	Result not detected or below Reporting Limit
NT	Not a TNI Analyte
LCS	Laboratory Control Sample
LRB	Laboratory Reagent Blank (also referred to as Method Blank)
DUP	Duplicate
MS	Matrix Spike
MSD	Matrix Spike Duplicate
RPD	Relative Percent Difference
MDL	Method Detection Limit
PQL	Practical Quantitation Limit
TDL	Target Detection Limit
SM	Standard Methods Compendium

<u>Qualifier</u>	<u>Description</u>
*	Generic data flag, applicable description added in the corresponding notes section
B	The analyte was detected in the LRB at a level which is significant relative to sample result

D	Reporting limit elevated due to dilution
E	Estimated due to result exceeding the linear range of the analyzer
H	The maximum recommended hold time was exceeded
I	Dilution required due to matrix interference; reporting limit elevated
J	Estimated due to result found above MDL but below PQL (or RL)
K	Reporting limit raised due to matrix interference
M	The precision for duplicate analysis was not met; RPD outside acceptance criteria
N	Non-homogeneous sample made analysis questionable
PI	Possible interference may have affected the accuracy of the laboratory result
Q	Matrix Spike or Matrix Spike Duplicate recovery outside acceptance criteria
R	Result confirmed by new sample preparation and reanalysis
X	Other notation required; comment listed in sample notes and/or case narrative

Work Order Sample Summary

Customer Name: JH Campbell Complex
Work Order ID: Q4-2020 RCRA GW Monitoring Background Wells
Date Received: 10/22/2020
Chemistry Project: 20-1192

<u>Sample #</u>	<u>Field Sample ID</u>	<u>Matrix</u>	<u>Sample Date</u>	<u>Site</u>
20-1192-01	JHC-MW-15023	Groundwater	10/20/2020 04:03 PM	JHC RCRA GW Monitoring - Background Wells
20-1192-02	JHC-MW-15024	Groundwater	10/20/2020 02:52 PM	JHC RCRA GW Monitoring - Background Wells
20-1192-03	JHC-MW-15025	Groundwater	10/20/2020 01:55 PM	JHC RCRA GW Monitoring - Background Wells
20-1192-04	JHC-MW-15026	Groundwater	10/20/2020 12:51 PM	JHC RCRA GW Monitoring - Background Wells
20-1192-05	JHC-MW-15027	Groundwater	10/20/2020 12:00 PM	JHC RCRA GW Monitoring - Background Wells
20-1192-06	JHC-MW-15028	Groundwater	10/20/2020 10:38 AM	JHC RCRA GW Monitoring - Background Wells
20-1192-07	DUP-01	Groundwater	10/20/2020 12:00 AM	JHC RCRA GW Monitoring - Background Wells
20-1192-08	FB-01	Water	10/20/2020 04:12 PM	JHC RCRA GW Monitoring - Background Wells
20-1192-09	EB-01	Water	10/20/2020 02:14 PM	JHC RCRA GW Monitoring - Background Wells
20-1192-10	JHC-MW-15025 Field MS	Groundwater	10/20/2020 01:55 PM	JHC RCRA GW Monitoring - Background Wells
20-1192-11	JHC-MW-15025 Field MSD	Groundwater	10/20/2020 01:55 PM	JHC RCRA GW Monitoring - Background Wells

Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **JHC RCRA GW Monitoring - Background Wells (395496)**
 Field Sample ID: **JHC-MW-15023**
 Lab Sample ID: 20-1192-01
 Matrix: Groundwater

Laboratory Project: **20-1192**
 Collect Date: 10/20/2020
 Collect Time: 04:03 PM

Mercury by EPA 7470A, Total, Aqueous

Aliquot: 20-1192-01-C01-A01 Analyst: SLK

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Mercury	ND		ug/L	0.2	10/30/2020	AB20-1030-01

Metals by EPA 6020; HMP/AMP Detection & Assessment Monitoring

Aliquot: 20-1192-01-C01-A02 Analyst: SLK

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Antimony	ND		ug/L	1	11/05/2020	AB20-1105-07
Arsenic	ND		ug/L	1	11/05/2020	AB20-1105-07
Barium	21		ug/L	5	11/05/2020	AB20-1105-07
Beryllium	ND		ug/L	1	11/05/2020	AB20-1105-07
Boron	71		ug/L	20	11/05/2020	AB20-1105-07
Cadmium	ND		ug/L	0.2	11/05/2020	AB20-1105-07
Calcium	11100		ug/L	1000	11/05/2020	AB20-1105-07
Chromium	ND		ug/L	1	11/05/2020	AB20-1105-07
Cobalt	ND		ug/L	6	11/05/2020	AB20-1105-07
Copper	ND		ug/L	1	11/05/2020	AB20-1105-07
Iron	177		ug/L	20	11/05/2020	AB20-1105-07
Lead	ND		ug/L	1	11/05/2020	AB20-1105-07
Lithium	ND		ug/L	10	11/05/2020	AB20-1105-07
Molybdenum	ND		ug/L	5	11/05/2020	AB20-1105-07
Nickel	ND		ug/L	2	11/05/2020	AB20-1105-07
Selenium	ND		ug/L	1	11/05/2020	AB20-1105-07
Silver	ND		ug/L	0.2	11/05/2020	AB20-1105-07
Thallium	ND		ug/L	2	11/05/2020	AB20-1105-07
Vanadium	ND		ug/L	2	11/05/2020	AB20-1105-07
Zinc	ND		ug/L	10	11/05/2020	AB20-1105-07

Anions by EPA 300.0 CCR Rule Analyte List, Cl, F, SO4, Aqueous

Aliquot: 20-1192-01-C02-A01 Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Chloride	1600		ug/L	1000	10/29/2020	AB20-1029-06
Fluoride	ND		ug/L	1000	10/29/2020	AB20-1029-06
Sulfate	10100		ug/L	1000	10/29/2020	AB20-1029-06

Total Dissolved Solids by SM 2540C

Aliquot: 20-1192-01-C03-A01 Analyst: SLK

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Total Dissolved Solids	57		mg/L	10	10/23/2020	AB20-1028-07

Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **JHC RCRA GW Monitoring - Background Wells (395496)**
 Field Sample ID: **JHC-MW-15024**
 Lab Sample ID: 20-1192-02
 Matrix: Groundwater

Laboratory Project: **20-1192**
 Collect Date: 10/20/2020
 Collect Time: 02:52 PM

Mercury by EPA 7470A, Total, Aqueous

Aliquot: 20-1192-02-C01-A01 Analyst: SLK

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Mercury	ND		ug/L	0.2	10/30/2020	AB20-1030-01

Metals by EPA 6020; HMP/AMP Detection & Assessment Monitoring

Aliquot: 20-1192-02-C01-A02 Analyst: SLK

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Antimony	ND		ug/L	1	11/05/2020	AB20-1105-07
Arsenic	ND		ug/L	1	11/05/2020	AB20-1105-07
Barium	20		ug/L	5	11/05/2020	AB20-1105-07
Beryllium	ND		ug/L	1	11/05/2020	AB20-1105-07
Boron	35		ug/L	20	11/05/2020	AB20-1105-07
Cadmium	ND		ug/L	0.2	11/05/2020	AB20-1105-07
Calcium	39000		ug/L	1000	11/05/2020	AB20-1105-07
Chromium	ND		ug/L	1	11/05/2020	AB20-1105-07
Cobalt	ND		ug/L	6	11/05/2020	AB20-1105-07
Copper	2		ug/L	1	11/05/2020	AB20-1105-07
Iron	664		ug/L	20	11/05/2020	AB20-1105-07
Lead	ND		ug/L	1	11/05/2020	AB20-1105-07
Lithium	ND		ug/L	10	11/05/2020	AB20-1105-07
Molybdenum	ND		ug/L	5	11/05/2020	AB20-1105-07
Nickel	ND		ug/L	2	11/05/2020	AB20-1105-07
Selenium	1		ug/L	1	11/05/2020	AB20-1105-07
Silver	ND		ug/L	0.2	11/05/2020	AB20-1105-07
Thallium	ND		ug/L	2	11/05/2020	AB20-1105-07
Vanadium	ND		ug/L	2	11/05/2020	AB20-1105-07
Zinc	ND		ug/L	10	11/05/2020	AB20-1105-07

Anions by EPA 300.0 CCR Rule Analyte List, Cl, F, SO4, Aqueous

Aliquot: 20-1192-02-C02-A01 Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Chloride	17100		ug/L	1000	10/29/2020	AB20-1029-06
Fluoride	ND		ug/L	1000	10/29/2020	AB20-1029-06
Sulfate	8930		ug/L	1000	10/29/2020	AB20-1029-06

Total Dissolved Solids by SM 2540C

Aliquot: 20-1192-02-C03-A01 Analyst: SLK

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Total Dissolved Solids	181		mg/L	10	10/23/2020	AB20-1028-07

Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **JHC RCRA GW Monitoring - Background Wells (395496)**
 Field Sample ID: **JHC-MW-15025**
 Lab Sample ID: 20-1192-03
 Matrix: Groundwater

Laboratory Project: **20-1192**
 Collect Date: 10/20/2020
 Collect Time: 01:55 PM

Mercury by EPA 7470A, Total, Aqueous

Aliquot: 20-1192-03-C01-A01

Analyst: SLK

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Mercury	ND		ug/L	0.2	10/30/2020	AB20-1030-01

Metals by EPA 6020; HMP/AMP Detection & Assessment Monitoring

Aliquot: 20-1192-03-C01-A02

Analyst: SLK

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Antimony	ND		ug/L	1	11/05/2020	AB20-1105-07
Arsenic	ND		ug/L	1	11/05/2020	AB20-1105-07
Barium	11		ug/L	5	11/05/2020	AB20-1105-07
Beryllium	ND		ug/L	1	11/05/2020	AB20-1105-07
Boron	33		ug/L	20	11/05/2020	AB20-1105-07
Cadmium	ND		ug/L	0.2	11/05/2020	AB20-1105-07
Calcium	23200		ug/L	1000	11/05/2020	AB20-1105-07
Chromium	ND		ug/L	1	11/05/2020	AB20-1105-07
Cobalt	ND		ug/L	6	11/05/2020	AB20-1105-07
Copper	1		ug/L	1	11/05/2020	AB20-1105-07
Iron	20		ug/L	20	11/05/2020	AB20-1105-07
Lead	ND		ug/L	1	11/05/2020	AB20-1105-07
Lithium	ND		ug/L	10	11/05/2020	AB20-1105-07
Molybdenum	ND		ug/L	5	11/05/2020	AB20-1105-07
Nickel	ND		ug/L	2	11/05/2020	AB20-1105-07
Selenium	1		ug/L	1	11/05/2020	AB20-1105-07
Silver	ND		ug/L	0.2	11/05/2020	AB20-1105-07
Thallium	ND		ug/L	2	11/05/2020	AB20-1105-07
Vanadium	ND		ug/L	2	11/05/2020	AB20-1105-07
Zinc	ND		ug/L	10	11/05/2020	AB20-1105-07

Anions by EPA 300.0 CCR Rule Analyte List, Cl, F, SO4, Aqueous

Aliquot: 20-1192-03-C02-A01

Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Chloride	22600		ug/L	1000	10/29/2020	AB20-1029-06
Fluoride	ND		ug/L	1000	10/29/2020	AB20-1029-06
Sulfate	9820		ug/L	1000	10/29/2020	AB20-1029-06

Total Dissolved Solids by SM 2540C

Aliquot: 20-1192-03-C03-A01

Analyst: SLK

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Total Dissolved Solids	142		mg/L	10	10/23/2020	AB20-1028-07



Analytical Report

Report Date: 11/11/20

Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **JHC RCRA GW Monitoring - Background Wells (395496)**
 Field Sample ID: **JHC-MW-15026**
 Lab Sample ID: 20-1192-04
 Matrix: Groundwater

Laboratory Project: **20-1192**
 Collect Date: 10/20/2020
 Collect Time: 12:51 PM

Mercury by EPA 7470A, Total, Aqueous

Aliquot: 20-1192-04-C01-A01 Analyst: SLK

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Mercury	ND		ug/L	0.2	10/30/2020	AB20-1030-01

Metals by EPA 6020; HMP/AMP Detection & Assessment Monitoring

Aliquot: 20-1192-04-C01-A02 Analyst: SLK

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Antimony	ND		ug/L	1	11/05/2020	AB20-1105-07
Arsenic	ND		ug/L	1	11/05/2020	AB20-1105-07
Barium	14		ug/L	5	11/05/2020	AB20-1105-07
Beryllium	ND		ug/L	1	11/05/2020	AB20-1105-07
Boron	25		ug/L	20	11/05/2020	AB20-1105-07
Cadmium	ND		ug/L	0.2	11/05/2020	AB20-1105-07
Calcium	17100		ug/L	1000	11/05/2020	AB20-1105-07
Chromium	ND		ug/L	1	11/05/2020	AB20-1105-07
Cobalt	ND		ug/L	6	11/05/2020	AB20-1105-07
Copper	ND		ug/L	1	11/05/2020	AB20-1105-07
Iron	39		ug/L	20	11/05/2020	AB20-1105-07
Lead	ND		ug/L	1	11/05/2020	AB20-1105-07
Lithium	ND		ug/L	10	11/05/2020	AB20-1105-07
Molybdenum	ND		ug/L	5	11/05/2020	AB20-1105-07
Nickel	ND		ug/L	2	11/05/2020	AB20-1105-07
Selenium	ND		ug/L	1	11/05/2020	AB20-1105-07
Silver	ND		ug/L	0.2	11/05/2020	AB20-1105-07
Thallium	ND		ug/L	2	11/05/2020	AB20-1105-07
Vanadium	ND		ug/L	2	11/05/2020	AB20-1105-07
Zinc	ND		ug/L	10	11/05/2020	AB20-1105-07

Anions by EPA 300.0 CCR Rule Analyte List, Cl, F, SO4, Aqueous

Aliquot: 20-1192-04-C02-A01 Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Chloride	5330		ug/L	1000	10/29/2020	AB20-1029-06
Fluoride	ND		ug/L	1000	10/29/2020	AB20-1029-06
Sulfate	7870		ug/L	1000	10/29/2020	AB20-1029-06

Total Dissolved Solids by SM 2540C

Aliquot: 20-1192-04-C03-A01 Analyst: SLK

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Total Dissolved Solids	75		mg/L	10	10/23/2020	AB20-1028-07

Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **JHC RCRA GW Monitoring - Background Wells (395496)**
 Field Sample ID: **JHC-MW-15027**
 Lab Sample ID: 20-1192-05
 Matrix: Groundwater

Laboratory Project: **20-1192**
 Collect Date: 10/20/2020
 Collect Time: 12:00 PM

Mercury by EPA 7470A, Total, Aqueous

Aliquot: 20-1192-05-C01-A01 Analyst: SLK

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Mercury	ND		ug/L	0.2	10/30/2020	AB20-1030-01

Metals by EPA 6020; HMP/AMP Detection & Assessment Monitoring

Aliquot: 20-1192-05-C01-A02 Analyst: SLK

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Antimony	ND		ug/L	1	11/05/2020	AB20-1105-07
Arsenic	ND		ug/L	1	11/05/2020	AB20-1105-07
Barium	14		ug/L	5	11/05/2020	AB20-1105-07
Beryllium	ND		ug/L	1	11/05/2020	AB20-1105-07
Boron	ND		ug/L	20	11/05/2020	AB20-1105-07
Cadmium	ND		ug/L	0.2	11/05/2020	AB20-1105-07
Calcium	12900		ug/L	1000	11/05/2020	AB20-1105-07
Chromium	ND		ug/L	1	11/05/2020	AB20-1105-07
Cobalt	ND		ug/L	6	11/05/2020	AB20-1105-07
Copper	ND		ug/L	1	11/05/2020	AB20-1105-07
Iron	194		ug/L	20	11/05/2020	AB20-1105-07
Lead	ND		ug/L	1	11/05/2020	AB20-1105-07
Lithium	ND		ug/L	10	11/05/2020	AB20-1105-07
Molybdenum	ND		ug/L	5	11/05/2020	AB20-1105-07
Nickel	ND		ug/L	2	11/05/2020	AB20-1105-07
Selenium	ND		ug/L	1	11/05/2020	AB20-1105-07
Silver	ND		ug/L	0.2	11/05/2020	AB20-1105-07
Thallium	ND		ug/L	2	11/05/2020	AB20-1105-07
Vanadium	ND		ug/L	2	11/05/2020	AB20-1105-07
Zinc	ND		ug/L	10	11/05/2020	AB20-1105-07

Anions by EPA 300.0 CCR Rule Analyte List, Cl, F, SO4, Aqueous

Aliquot: 20-1192-05-C02-A01 Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Chloride	ND		ug/L	1000	10/29/2020	AB20-1029-06
Fluoride	ND		ug/L	1000	10/29/2020	AB20-1029-06
Sulfate	6540		ug/L	1000	10/29/2020	AB20-1029-06

Total Dissolved Solids by SM 2540C

Aliquot: 20-1192-05-C03-A01 Analyst: SLK

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Total Dissolved Solids	49		mg/L	10	10/23/2020	AB20-1028-07

Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **JHC RCRA GW Monitoring - Background Wells (395496)**
 Field Sample ID: **JHC-MW-15028**
 Lab Sample ID: 20-1192-06
 Matrix: Groundwater

Laboratory Project: **20-1192**
 Collect Date: 10/20/2020
 Collect Time: 10:38 AM

Mercury by EPA 7470A, Total, Aqueous

Aliquot: 20-1192-06-C01-A01 Analyst: SLK

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Mercury	ND		ug/L	0.2	10/30/2020	AB20-1030-01

Metals by EPA 6020; HMP/AMP Detection & Assessment Monitoring

Aliquot: 20-1192-06-C01-A02 Analyst: SLK

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Antimony	ND		ug/L	1	11/05/2020	AB20-1105-07
Arsenic	ND		ug/L	1	11/05/2020	AB20-1105-07
Barium	7		ug/L	5	11/05/2020	AB20-1105-07
Beryllium	ND		ug/L	1	11/05/2020	AB20-1105-07
Boron	ND		ug/L	20	11/05/2020	AB20-1105-07
Cadmium	ND		ug/L	0.2	11/05/2020	AB20-1105-07
Calcium	17400		ug/L	1000	11/05/2020	AB20-1105-07
Chromium	ND		ug/L	1	11/05/2020	AB20-1105-07
Cobalt	ND		ug/L	6	11/05/2020	AB20-1105-07
Copper	ND		ug/L	1	11/05/2020	AB20-1105-07
Iron	33		ug/L	20	11/05/2020	AB20-1105-07
Lead	ND		ug/L	1	11/05/2020	AB20-1105-07
Lithium	ND		ug/L	10	11/05/2020	AB20-1105-07
Molybdenum	ND		ug/L	5	11/05/2020	AB20-1105-07
Nickel	ND		ug/L	2	11/05/2020	AB20-1105-07
Selenium	ND		ug/L	1	11/05/2020	AB20-1105-07
Silver	ND		ug/L	0.2	11/05/2020	AB20-1105-07
Thallium	ND		ug/L	2	11/05/2020	AB20-1105-07
Vanadium	ND		ug/L	2	11/05/2020	AB20-1105-07
Zinc	ND		ug/L	10	11/05/2020	AB20-1105-07

Anions by EPA 300.0 CCR Rule Analyte List, Cl, F, SO4, Aqueous

Aliquot: 20-1192-06-C02-A01 Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Chloride	ND		ug/L	1000	10/29/2020	AB20-1029-06
Fluoride	ND		ug/L	1000	10/29/2020	AB20-1029-06
Sulfate	6150		ug/L	1000	10/29/2020	AB20-1029-06

Total Dissolved Solids by SM 2540C

Aliquot: 20-1192-06-C03-A01 Analyst: SLK

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Total Dissolved Solids	68		mg/L	10	10/23/2020	AB20-1028-07

Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **JHC RCRA GW Monitoring - Background Wells (395496)**
 Field Sample ID: **DUP-01**
 Lab Sample ID: 20-1192-07
 Matrix: Groundwater

Laboratory Project: **20-1192**
 Collect Date: 10/20/2020
 Collect Time: 12:00 AM

Mercury by EPA 7470A, Total, Aqueous

Aliquot: 20-1192-07-C01-A01

Analyst: SLK

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Mercury	ND		ug/L	0.2	10/30/2020	AB20-1030-01

Metals by EPA 6020; HMP/AMP Detection & Assessment Monitoring

Aliquot: 20-1192-07-C01-A02

Analyst: SLK

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Antimony	ND		ug/L	1	11/05/2020	AB20-1105-07
Arsenic	ND		ug/L	1	11/05/2020	AB20-1105-07
Barium	7		ug/L	5	11/05/2020	AB20-1105-07
Beryllium	ND		ug/L	1	11/05/2020	AB20-1105-07
Boron	ND		ug/L	20	11/05/2020	AB20-1105-07
Cadmium	ND		ug/L	0.2	11/05/2020	AB20-1105-07
Calcium	19300		ug/L	1000	11/05/2020	AB20-1105-07
Chromium	ND		ug/L	1	11/05/2020	AB20-1105-07
Cobalt	ND		ug/L	6	11/05/2020	AB20-1105-07
Copper	ND		ug/L	1	11/05/2020	AB20-1105-07
Iron	32		ug/L	20	11/05/2020	AB20-1105-07
Lead	2		ug/L	1	11/05/2020	AB20-1105-07
Lithium	ND		ug/L	10	11/05/2020	AB20-1105-07
Molybdenum	ND		ug/L	5	11/05/2020	AB20-1105-07
Nickel	ND		ug/L	2	11/05/2020	AB20-1105-07
Selenium	ND		ug/L	1	11/05/2020	AB20-1105-07
Silver	ND		ug/L	0.2	11/05/2020	AB20-1105-07
Thallium	ND		ug/L	2	11/05/2020	AB20-1105-07
Vanadium	ND		ug/L	2	11/05/2020	AB20-1105-07
Zinc	ND		ug/L	10	11/05/2020	AB20-1105-07

Anions by EPA 300.0 CCR Rule Analyte List, Cl, F, SO4, Aqueous

Aliquot: 20-1192-07-C02-A01

Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Chloride	ND		ug/L	1000	10/29/2020	AB20-1029-06
Fluoride	ND		ug/L	1000	10/29/2020	AB20-1029-06
Sulfate	6260		ug/L	1000	10/29/2020	AB20-1029-06

Total Dissolved Solids by SM 2540C

Aliquot: 20-1192-07-C03-A01

Analyst: SLK

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Total Dissolved Solids	72		mg/L	10	10/23/2020	AB20-1028-07

Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **JHC RCRA GW Monitoring - Background Wells (395496)**
 Field Sample ID: **FB-01**
 Lab Sample ID: 20-1192-08
 Matrix: Water

Laboratory Project: **20-1192**
 Collect Date: 10/20/2020
 Collect Time: 04:12 PM

Mercury by EPA 7470A, Total, Aqueous

Aliquot: 20-1192-08-C01-A01

Analyst: SLK

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Mercury	ND		ug/L	0.2	10/30/2020	AB20-1030-01

Metals by EPA 6020; HMP/AMP Detection & Assessment Monitoring

Aliquot: 20-1192-08-C01-A02

Analyst: SLK

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Antimony	ND		ug/L	1	11/05/2020	AB20-1105-07
Arsenic	ND		ug/L	1	11/05/2020	AB20-1105-07
Barium	ND		ug/L	5	11/05/2020	AB20-1105-07
Beryllium	ND		ug/L	1	11/05/2020	AB20-1105-07
Boron	ND		ug/L	20	11/05/2020	AB20-1105-07
Cadmium	ND		ug/L	0.2	11/05/2020	AB20-1105-07
Calcium	ND		ug/L	1000	11/05/2020	AB20-1105-07
Chromium	ND		ug/L	1	11/05/2020	AB20-1105-07
Cobalt	ND		ug/L	6	11/05/2020	AB20-1105-07
Copper	ND		ug/L	1	11/05/2020	AB20-1105-07
Iron	ND		ug/L	20	11/05/2020	AB20-1105-07
Lead	ND		ug/L	1	11/05/2020	AB20-1105-07
Lithium	ND		ug/L	10	11/05/2020	AB20-1105-07
Molybdenum	ND		ug/L	5	11/05/2020	AB20-1105-07
Nickel	ND		ug/L	2	11/05/2020	AB20-1105-07
Selenium	ND		ug/L	1	11/05/2020	AB20-1105-07
Silver	ND		ug/L	0.2	11/05/2020	AB20-1105-07
Thallium	ND		ug/L	2	11/05/2020	AB20-1105-07
Vanadium	ND		ug/L	2	11/05/2020	AB20-1105-07
Zinc	ND		ug/L	10	11/05/2020	AB20-1105-07

Anions by EPA 300.0 CCR Rule Analyte List, Cl, F, SO4, Aqueous

Aliquot: 20-1192-08-C02-A01

Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Chloride	ND		ug/L	1000	10/29/2020	AB20-1029-06
Fluoride	ND		ug/L	1000	10/29/2020	AB20-1029-06
Sulfate	ND		ug/L	1000	10/29/2020	AB20-1029-06

Total Dissolved Solids by SM 2540C

Aliquot: 20-1192-08-C03-A01

Analyst: SLK

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Total Dissolved Solids	ND		mg/L	10	10/23/2020	AB20-1028-07

Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **JHC RCRA GW Monitoring - Background Wells (395496)**
 Field Sample ID: **EB-01**
 Lab Sample ID: 20-1192-09
 Matrix: Water

Laboratory Project: **20-1192**
 Collect Date: 10/20/2020
 Collect Time: 02:14 PM

Mercury by EPA 7470A, Total, Aqueous

Aliquot: 20-1192-09-C01-A01

Analyst: SLK

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Mercury	ND		ug/L	0.2	10/30/2020	AB20-1030-01

Metals by EPA 6020; HMP/AMP Detection & Assessment Monitoring

Aliquot: 20-1192-09-C01-A02

Analyst: SLK

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Antimony	ND		ug/L	1	11/05/2020	AB20-1105-07
Arsenic	ND		ug/L	1	11/05/2020	AB20-1105-07
Barium	ND		ug/L	5	11/05/2020	AB20-1105-07
Beryllium	ND		ug/L	1	11/05/2020	AB20-1105-07
Boron	ND		ug/L	20	11/05/2020	AB20-1105-07
Cadmium	ND		ug/L	0.2	11/05/2020	AB20-1105-07
Calcium	ND		ug/L	1000	11/05/2020	AB20-1105-07
Chromium	ND		ug/L	1	11/05/2020	AB20-1105-07
Cobalt	ND		ug/L	6	11/05/2020	AB20-1105-07
Copper	ND		ug/L	1	11/05/2020	AB20-1105-07
Iron	ND		ug/L	20	11/05/2020	AB20-1105-07
Lead	ND		ug/L	1	11/05/2020	AB20-1105-07
Lithium	ND		ug/L	10	11/05/2020	AB20-1105-07
Molybdenum	ND		ug/L	5	11/05/2020	AB20-1105-07
Nickel	ND		ug/L	2	11/05/2020	AB20-1105-07
Selenium	ND		ug/L	1	11/05/2020	AB20-1105-07
Silver	ND		ug/L	0.2	11/05/2020	AB20-1105-07
Thallium	ND		ug/L	2	11/05/2020	AB20-1105-07
Vanadium	ND		ug/L	2	11/05/2020	AB20-1105-07
Zinc	ND		ug/L	10	11/05/2020	AB20-1105-07

Anions by EPA 300.0 CCR Rule Analyte List, Cl, F, SO4, Aqueous

Aliquot: 20-1192-09-C02-A01

Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Chloride	ND		ug/L	1000	10/29/2020	AB20-1029-06
Fluoride	ND		ug/L	1000	10/29/2020	AB20-1029-06
Sulfate	ND		ug/L	1000	10/29/2020	AB20-1029-06

Total Dissolved Solids by SM 2540C

Aliquot: 20-1192-09-C03-A01

Analyst: SLK

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Total Dissolved Solids	ND		mg/L	10	10/23/2020	AB20-1028-07

Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **JHC RCRA GW Monitoring - Background Wells (395496)**
 Field Sample ID: **JHC-MW-15025 Field MS**
 Lab Sample ID: 20-1192-10
 Matrix: Groundwater

Laboratory Project: **20-1192**
 Collect Date: 10/20/2020
 Collect Time: 01:55 PM

Mercury by EPA 7470A, Total, Aqueous

Aliquot: 20-1192-10-C01-A01 Analyst: SLK

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Mercury	85.8		%	0.2	10/30/2020	AB20-1030-01

Metals by EPA 6020; HMP/AMP Detection & Assessment Monitoring

Aliquot: 20-1192-10-C01-A02 Analyst: SLK

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Antimony	110		%	1	11/05/2020	AB20-1105-07
Arsenic	105		%	1	11/05/2020	AB20-1105-07
Barium	108		%	5	11/05/2020	AB20-1105-07
Beryllium	111		%	1	11/05/2020	AB20-1105-07
Boron	101		%	20	11/05/2020	AB20-1105-07
Cadmium	107		%	0.2	11/05/2020	AB20-1105-07
Calcium	108		%	1000	11/05/2020	AB20-1105-07
Chromium	106		%	1	11/05/2020	AB20-1105-07
Cobalt	106		%	6	11/05/2020	AB20-1105-07
Copper	103		%	1	11/05/2020	AB20-1105-07
Iron	106		%	20	11/05/2020	AB20-1105-07
Lead	103		%	1	11/05/2020	AB20-1105-07
Lithium	111		%	10	11/05/2020	AB20-1105-07
Molybdenum	107		%	5	11/05/2020	AB20-1105-07
Nickel	104		%	2	11/05/2020	AB20-1105-07
Selenium	105		%	1	11/05/2020	AB20-1105-07
Silver	105		%	0.2	11/05/2020	AB20-1105-07
Thallium	103		%	2	11/05/2020	AB20-1105-07
Vanadium	109		%	2	11/05/2020	AB20-1105-07
Zinc	106		%	10	11/05/2020	AB20-1105-07

Anions by EPA 300.0 CCR Rule Analyte List, Cl, F, SO4, Aqueous

Aliquot: 20-1192-10-C02-A01 Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Chloride	95		%	1000	10/29/2020	AB20-1029-06
Fluoride	96		%	1000	10/29/2020	AB20-1029-06
Sulfate	95		%	1000	10/29/2020	AB20-1029-06



Analytical Report

Report Date: 11/11/20

Laboratory Services A CENTURY OF EXCELLENCE

Sample Site: **JHC RCRA GW Monitoring - Background Wells (395496)**
 Field Sample ID: **JHC-MW-15025 Field MSD**
 Lab Sample ID: 20-1192-11
 Matrix: Groundwater

Laboratory Project: **20-1192**
 Collect Date: 10/20/2020
 Collect Time: 01:55 PM

Mercury by EPA 7470A, Total, Aqueous

Aliquot: 20-1192-11-C01-A01

Analyst: SLK

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Mercury	101		%	0.2	10/30/2020	AB20-1030-01

Metals by EPA 6020; HMP/AMP Detection & Assessment Monitoring

Aliquot: 20-1192-11-C01-A02

Analyst: SLK

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Antimony	110		%	1	11/05/2020	AB20-1105-07
Arsenic	106		%	1	11/05/2020	AB20-1105-07
Barium	107		%	5	11/05/2020	AB20-1105-07
Beryllium	111		%	1	11/05/2020	AB20-1105-07
Boron	102		%	20	11/05/2020	AB20-1105-07
Cadmium	108		%	0.2	11/05/2020	AB20-1105-07
Calcium	107		%	1000	11/05/2020	AB20-1105-07
Chromium	106		%	1	11/05/2020	AB20-1105-07
Cobalt	107		%	6	11/05/2020	AB20-1105-07
Copper	104		%	1	11/05/2020	AB20-1105-07
Iron	105		%	20	11/05/2020	AB20-1105-07
Lead	103		%	1	11/05/2020	AB20-1105-07
Lithium	111		%	10	11/05/2020	AB20-1105-07
Molybdenum	108		%	5	11/05/2020	AB20-1105-07
Nickel	104		%	2	11/05/2020	AB20-1105-07
Selenium	105		%	1	11/05/2020	AB20-1105-07
Silver	104		%	0.2	11/05/2020	AB20-1105-07
Thallium	104		%	2	11/05/2020	AB20-1105-07
Vanadium	108		%	2	11/05/2020	AB20-1105-07
Zinc	107		%	10	11/05/2020	AB20-1105-07

Anions by EPA 300.0 CCR Rule Analyte List, Cl, F, SO4, Aqueous

Aliquot: 20-1192-11-C02-A01

Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Chloride	96		%	1000	10/29/2020	AB20-1029-06
Fluoride	98		%	1000	10/29/2020	AB20-1029-06
Sulfate	97		%	1000	10/29/2020	AB20-1029-06

Data Qualifiers	Exception Summary
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No exceptions occurred.

TITLE: SAMPLE LOG-IN – SHIPMENT INSPECTION FORM

Project Log-In Number: 20-1192

Inspection Date: 10-22-2020 Inspection By: EW

Sample Origin/Project Name: JHC Q4 2020 PERA CW Monitoring

Shipment Delivered By: Enter the type of shipment carrier.

Pony _____ FedEx _____ UPS _____ USPS _____ Airborne _____

Other/Hand Carry (whom) EB

Tracking Number: _____ Shipping Form Attached: Yes _____ No _____

Shipping Containers: Enter the type and number of shipping containers received.

Cooler 1 Cardboard Box _____ Custom Case _____ Envelope/Mailer _____

Loose/Unpackaged Containers _____ Other _____

Condition of Shipment: Enter the as-received condition of the shipment container.

Damaged Shipment Observed: None Dented _____ Leaking _____

Other _____

Shipment Security: Enter if any of the shipping containers were opened before receipt.

Shipping Containers Received: Opened _____ Sealed

Enclosed Documents: Enter the type of documents enclosed with the shipment.

CoC Work Request _____ Air Data Sheet _____ Other _____

Temperature of Containers: Measure the temperature of several sample containers.

As-Received Temperature Range 1.2 - 2.8 °C Samples Received on Ice: Yes No _____

M&TE # and Expiration Q15102 6/4/21

Number and Type of Containers: Enter the total number of sample containers received.

Container Type	Water	Soil	Other	Broken	Leaking
VOA (40mL or 60mL)	_____	_____	_____	_____	_____
Quart/Liter (g/p)	<u>18</u>	_____	_____	_____	_____
9-oz (amber glass jar)	_____	_____	_____	_____	_____
2-oz (amber glass)	_____	_____	_____	_____	_____
125 mL (plastic)	<u>22</u>	_____	_____	_____	_____
24 mL vial (glass)	_____	_____	_____	_____	_____
500 mL (plastic)	_____	_____	_____	_____	_____
Other <u>250 mL Plastic</u>	<u>9</u>	_____	_____	_____	_____

To: CDBatts, JH Campbell Complex

From: EBlaj, T-258

Date: November 11, 2020

Subject: JH CAMPBELL SOLID WASTE DISPOSAL AREA – GROUNDWATER MONITORING
4th Quarter, 2020 – Pond A CCR Wells

CC: BLSwanberg, P22-119
BTRunkel, P22-120
HDRegister, P22-521

Sarah Holmstrom, Project Manager
TRC Companies, Inc.
1540 Eisenhower Place
Ann Arbor, MI 48108

Chemistry Project: 20-1195

CE Laboratory Services conducted groundwater monitoring on 10/19/2020 through 10/23/2020 at the JH Campbell Solid Waste Disposal Area, for the 4th Quarter monitoring requirements. Samples were not collected from MW-15007, MW-15009, and MW-15010 due to wells being dry. All other samples were received for analysis by the Chemistry department on 10/26/2020.

Samples for Radium analysis have been subcontracted to Eurofins/TestAmerica, Inc. and their results are being reported separately. Please note that the subcontracted work is not reported under the CE laboratory scope of accreditation.

With the exception noted above, the report that follows presents the results of the requested analytical testing; the results apply only to the samples, as received. All samples have been analyzed in accordance with the 2016 TNI Standard and the applicable A2LA accreditation scope for Laboratory Services. Any exceptions to applicable test method criteria and standard compliance are noted in the Case Narrative, or flagged with applicable qualifiers in the analytical results section.

Reviewed and approved by:

Emil Blaj
Sr. Technical Analyst
Project Lead



Testing performed in accordance with the A2LA scope of accreditation specified in the listed certificate. The information contained in this report is the sole property of Consumers Energy. It cannot be reproduced except in full, and with consent from Consumers Energy, or the customer for which this report was issued.

CASE NARRATIVE

I. Sample Receipt

All samples were received within hold time and in good conditions; no anomalies were noted on the Sample Log-In Shipment Inspection Form during sample check-in. Identification of all samples included in the work order/project is provided in the sample summary section. Sample preservation upon receipt was verified by the sample custodian and confirmed to meet method requirements.

II. Methodology

Unless otherwise indicated, sample preparation and analysis was performed in accordance with the corresponding test methods from “Methods for the Determination of Inorganic Substances in Environmental Samples (EPA/600/R-93/100); SW-846, “Test Methods for Evaluating Solid Waste – Physical/Chemical Methods”, USEPA (latest revisions), and Standard Methods for the Examination of Water and Wastewater, APHA-AWWA-WPCF, 22nd Edition, 2012.

III. Results/Quality Control

Analytical results for this report are presented by laboratory sample ID, container & aliquot number. Results for the field blanks, field duplicates, and percent recoveries of the field matrix spike & matrix spike duplicate samples are included in the results section. Unless specifically noted in the case narrative, all method quality control requirements have been met. If any results are qualified, the corresponding data flags/qualifiers are listed on the last page of the results section. Any additional information on method performance, when applicable, is presented in this section of the case narrative. When data flags are not needed, the qualifiers text box on the last page is left blank, and a statement confirms that no exceptions occurred.

DEFINITIONS / QUALIFIERS

The following qualifiers and/or acronyms are used in the report where applicable:

<u>Acronym</u>	<u>Description</u>
RL	Reporting Limit
ND	Result not detected or below Reporting Limit
NT	Not a TNI Analyte
LCS	Laboratory Control Sample
LRB	Laboratory Reagent Blank (also referred to as Method Blank)
DUP	Duplicate
MS	Matrix Spike
MSD	Matrix Spike Duplicate
RPD	Relative Percent Difference
MDL	Method Detection Limit
PQL	Practical Quantitation Limit
TDL	Target Detection Limit
SM	Standard Methods Compendium

<u>Qualifier</u>	<u>Description</u>
*	Generic data flag, applicable description added in the corresponding notes section
B	The analyte was detected in the LRB at a level which is significant relative to sample result

D	Reporting limit elevated due to dilution
E	Estimated due to result exceeding the linear range of the analyzer
H	The maximum recommended hold time was exceeded
I	Dilution required due to matrix interference; reporting limit elevated
J	Estimated due to result found above MDL but below PQL (or RL)
K	Reporting limit raised due to matrix interference
M	The precision for duplicate analysis was not met; RPD outside acceptance criteria
N	Non-homogeneous sample made analysis questionable
PI	Possible interference may have affected the accuracy of the laboratory result
Q	Matrix Spike or Matrix Spike Duplicate recovery outside acceptance criteria
R	Result confirmed by new sample preparation and reanalysis
X	Other notation required; comment listed in sample notes and/or case narrative

Work Order Sample Summary

Customer Name: JH Campbell Complex
Work Order ID: Q4-2020 RCRA GW Monitoring Pond A Wells
Date Received: 10/26/2020
Chemistry Project: 20-1195

<u>Sample #</u>	<u>Field Sample ID</u>	<u>Matrix</u>	<u>Sample Date</u>	<u>Site</u>
20-1195-01	JHC-MW-15006	Groundwater	10/22/2020 05:37 PM	JHC RCRA GW Monitoring - Pond A AMP-HMP
20-1195-02	JHC-MW-15007	Well dry, sample not collected		JHC RCRA GW Monitoring - Pond A AMP-HMP
20-1195-03	JHC-MW-15008R	Groundwater	10/22/2020 04:12 PM	JHC RCRA GW Monitoring - Pond A AMP-HMP
20-1195-04	JHC-MW-15009	Well dry, sample not collected		JHC RCRA GW Monitoring - Pond A AMP-HMP
20-1195-05	JHC-MW-15010	Well dry, sample not collected		JHC RCRA GW Monitoring - Pond A AMP-HMP
20-1195-06	JHC-MW-15011	Groundwater	10/22/2020 04:50 PM	JHC RCRA GW Monitoring - Pond A AMP-HMP
20-1195-07	DUP-04	Groundwater	10/22/2020 05:37 PM	JHC RCRA GW Monitoring - Pond A AMP-HMP
20-1195-08	FB-04	Water	10/22/2020 07:11 PM	JHC RCRA GW Monitoring - Pond A AMP-HMP
20-1195-09	EB-04	Water	10/22/2020 07:11 PM	JHC RCRA GW Monitoring - Pond A AMP-HMP

Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **JHC RCRA GW Monitoring - Pond A AMP-HMP (395496)**
 Field Sample ID: **JHC-MW-15006**
 Lab Sample ID: 20-1195-01
 Matrix: Groundwater

Laboratory Project: **20-1195**
 Collect Date: 10/22/2020
 Collect Time: 05:37 PM

Mercury by EPA 7470A, Total, Aqueous

Aliquot: 20-1195-01-C01-A01 Analyst: SLK

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Mercury	ND		ug/L	0.2	10/29/2020	AB20-1029-04

Metals by EPA 6020; HMP/AMP Detection & Assessment Monitoring

Aliquot: 20-1195-01-C01-A02 Analyst: SLK

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Antimony	1		ug/L	1	11/05/2020	AB20-1105-07
Arsenic	9		ug/L	1	11/05/2020	AB20-1105-07
Barium	382		ug/L	5	11/05/2020	AB20-1105-07
Beryllium	ND		ug/L	1	11/05/2020	AB20-1105-07
Boron	272		ug/L	20	11/05/2020	AB20-1105-07
Cadmium	ND		ug/L	0.2	11/05/2020	AB20-1105-07
Calcium	87200		ug/L	1000	11/05/2020	AB20-1105-07
Chromium	5		ug/L	1	11/05/2020	AB20-1105-07
Cobalt	ND		ug/L	6	11/05/2020	AB20-1105-07
Copper	4		ug/L	1	11/05/2020	AB20-1105-07
Iron	929		ug/L	20	11/05/2020	AB20-1105-07
Lead	ND		ug/L	1	11/05/2020	AB20-1105-07
Lithium	15		ug/L	10	11/05/2020	AB20-1105-07
Molybdenum	38		ug/L	5	11/05/2020	AB20-1105-07
Nickel	5		ug/L	2	11/05/2020	AB20-1105-07
Selenium	2		ug/L	1	11/05/2020	AB20-1105-07
Silver	ND		ug/L	0.2	11/05/2020	AB20-1105-07
Thallium	ND		ug/L	2	11/05/2020	AB20-1105-07
Vanadium	19		ug/L	2	11/05/2020	AB20-1105-07
Zinc	11		ug/L	10	11/05/2020	AB20-1105-07

Anions by EPA 300.0 CCR Rule Analyte List, Cl, F, SO4, Aqueous

Aliquot: 20-1195-01-C02-A01 Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Chloride	22000		ug/L	1000	10/29/2020	AB20-1029-07
Fluoride	ND		ug/L	1000	10/29/2020	AB20-1029-07
Sulfate	253000		ug/L	1000	10/29/2020	AB20-1029-07

Total Dissolved Solids by SM 2540C

Aliquot: 20-1195-01-C03-A01 Analyst: SLK

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Total Dissolved Solids	515		mg/L	10	10/26/2020	AB20-1028-04

Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **JHC RCRA GW Monitoring - Pond A AMP-HMP (395496)**
 Field Sample ID: **JHC-MW-15008R**
 Lab Sample ID: 20-1195-03
 Matrix: Groundwater

Laboratory Project: **20-1195**
 Collect Date: 10/22/2020
 Collect Time: 04:12 PM

Mercury by EPA 7470A, Total, Aqueous

Aliquot: 20-1195-03-C01-A01 Analyst: SLK

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Mercury	ND		ug/L	0.2	10/29/2020	AB20-1029-04

Metals by EPA 6020; HMP/AMP Detection & Assessment Monitoring

Aliquot: 20-1195-03-C01-A02 Analyst: SLK

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Antimony	1		ug/L	1	11/05/2020	AB20-1105-07
Arsenic	ND		ug/L	1	11/05/2020	AB20-1105-07
Barium	216		ug/L	5	11/05/2020	AB20-1105-07
Beryllium	ND		ug/L	1	11/05/2020	AB20-1105-07
Boron	285		ug/L	20	11/05/2020	AB20-1105-07
Cadmium	ND		ug/L	0.2	11/05/2020	AB20-1105-07
Calcium	109000		ug/L	1000	11/05/2020	AB20-1105-07
Chromium	ND		ug/L	1	11/05/2020	AB20-1105-07
Cobalt	ND		ug/L	6	11/05/2020	AB20-1105-07
Copper	2		ug/L	1	11/05/2020	AB20-1105-07
Iron	56		ug/L	20	11/05/2020	AB20-1105-07
Lead	ND		ug/L	1	11/05/2020	AB20-1105-07
Lithium	19		ug/L	10	11/05/2020	AB20-1105-07
Molybdenum	5		ug/L	5	11/05/2020	AB20-1105-07
Nickel	ND		ug/L	2	11/05/2020	AB20-1105-07
Selenium	68		ug/L	1	11/05/2020	AB20-1105-07
Silver	ND		ug/L	0.2	11/05/2020	AB20-1105-07
Thallium	ND		ug/L	2	11/05/2020	AB20-1105-07
Vanadium	ND		ug/L	2	11/05/2020	AB20-1105-07
Zinc	ND		ug/L	10	11/05/2020	AB20-1105-07

Anions by EPA 300.0 CCR Rule Analyte List, Cl, F, SO4, Aqueous

Aliquot: 20-1195-03-C02-A01 Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Chloride	18800		ug/L	1000	10/29/2020	AB20-1029-07
Fluoride	ND		ug/L	1000	10/29/2020	AB20-1029-07
Sulfate	215000		ug/L	1000	10/29/2020	AB20-1029-07

Total Dissolved Solids by SM 2540C

Aliquot: 20-1195-03-C03-A01 Analyst: SLK

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Total Dissolved Solids	577		mg/L	10	10/26/2020	AB20-1028-04

Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **JHC RCRA GW Monitoring - Pond A AMP-HMP (395496)**
 Field Sample ID: **JHC-MW-15011**
 Lab Sample ID: 20-1195-06
 Matrix: Groundwater

Laboratory Project: **20-1195**
 Collect Date: 10/22/2020
 Collect Time: 04:50 PM

Mercury by EPA 7470A, Total, Aqueous

Aliquot: 20-1195-06-C01-A01 Analyst: SLK

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Mercury	ND		ug/L	0.2	10/29/2020	AB20-1029-04

Metals by EPA 6020; HMP/AMP Detection & Assessment Monitoring

Aliquot: 20-1195-06-C01-A02 Analyst: SLK

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Antimony	2		ug/L	1	11/05/2020	AB20-1105-07
Arsenic	22		ug/L	1	11/05/2020	AB20-1105-07
Barium	430		ug/L	5	11/05/2020	AB20-1105-07
Beryllium	ND		ug/L	1	11/05/2020	AB20-1105-07
Boron	4120		ug/L	20	11/05/2020	AB20-1105-07
Cadmium	0.5		ug/L	0.2	11/05/2020	AB20-1105-07
Calcium	122000		ug/L	1000	11/05/2020	AB20-1105-07
Chromium	ND		ug/L	1	11/05/2020	AB20-1105-07
Cobalt	ND		ug/L	6	11/05/2020	AB20-1105-07
Copper	1		ug/L	1	11/05/2020	AB20-1105-07
Iron	ND		ug/L	20	11/05/2020	AB20-1105-07
Lead	ND		ug/L	1	11/05/2020	AB20-1105-07
Lithium	17		ug/L	10	11/05/2020	AB20-1105-07
Molybdenum	ND		ug/L	5	11/05/2020	AB20-1105-07
Nickel	ND		ug/L	2	11/05/2020	AB20-1105-07
Selenium	308		ug/L	1	11/05/2020	AB20-1105-07
Silver	ND		ug/L	0.2	11/05/2020	AB20-1105-07
Thallium	ND		ug/L	2	11/05/2020	AB20-1105-07
Vanadium	49		ug/L	2	11/05/2020	AB20-1105-07
Zinc	ND		ug/L	10	11/05/2020	AB20-1105-07

Anions by EPA 300.0 CCR Rule Analyte List, Cl, F, SO4, Aqueous

Aliquot: 20-1195-06-C02-A01 Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Chloride	3790		ug/L	1000	10/29/2020	AB20-1029-07
Fluoride	ND		ug/L	1000	10/29/2020	AB20-1029-07
Sulfate	141000		ug/L	1000	10/29/2020	AB20-1029-07

Total Dissolved Solids by SM 2540C

Aliquot: 20-1195-06-C03-A01 Analyst: SLK

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Total Dissolved Solids	546		mg/L	10	10/26/2020	AB20-1028-04

Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **JHC RCRA GW Monitoring - Pond A AMP-HMP (395496)**
 Field Sample ID: **DUP-04**
 Lab Sample ID: 20-1195-07
 Matrix: Groundwater

Laboratory Project: **20-1195**
 Collect Date: 10/22/2020
 Collect Time: 05:37 PM

Mercury by EPA 7470A, Total, Aqueous

Aliquot: 20-1195-07-C01-A01 Analyst: SLK

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Mercury	ND		ug/L	0.2	10/29/2020	AB20-1029-04

Metals by EPA 6020; HMP/AMP Detection & Assessment Monitoring

Aliquot: 20-1195-07-C01-A02 Analyst: SLK

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Antimony	ND		ug/L	1	11/05/2020	AB20-1105-07
Arsenic	6		ug/L	1	11/05/2020	AB20-1105-07
Barium	194		ug/L	5	11/05/2020	AB20-1105-07
Beryllium	ND		ug/L	1	11/05/2020	AB20-1105-07
Boron	331		ug/L	20	11/05/2020	AB20-1105-07
Cadmium	ND		ug/L	0.2	11/05/2020	AB20-1105-07
Calcium	84300		ug/L	1000	11/05/2020	AB20-1105-07
Chromium	1		ug/L	1	11/05/2020	AB20-1105-07
Cobalt	ND		ug/L	6	11/05/2020	AB20-1105-07
Copper	4		ug/L	1	11/05/2020	AB20-1105-07
Iron	213		ug/L	20	11/05/2020	AB20-1105-07
Lead	ND		ug/L	1	11/05/2020	AB20-1105-07
Lithium	14		ug/L	10	11/05/2020	AB20-1105-07
Molybdenum	37		ug/L	5	11/05/2020	AB20-1105-07
Nickel	ND		ug/L	2	11/05/2020	AB20-1105-07
Selenium	1		ug/L	1	11/05/2020	AB20-1105-07
Silver	ND		ug/L	0.2	11/05/2020	AB20-1105-07
Thallium	ND		ug/L	2	11/05/2020	AB20-1105-07
Vanadium	9		ug/L	2	11/05/2020	AB20-1105-07
Zinc	23		ug/L	10	11/05/2020	AB20-1105-07

Anions by EPA 300.0 CCR Rule Analyte List, Cl, F, SO4, Aqueous

Aliquot: 20-1195-07-C02-A01 Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Chloride	22200		ug/L	1000	10/29/2020	AB20-1029-07
Fluoride	ND		ug/L	1000	10/29/2020	AB20-1029-07
Sulfate	251000		ug/L	1000	10/29/2020	AB20-1029-07

Total Dissolved Solids by SM 2540C

Aliquot: 20-1195-07-C03-A01 Analyst: SLK

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Total Dissolved Solids	511		mg/L	10	10/26/2020	AB20-1028-04

Laboratory Services
A CENTURY OF EXCELLENCE

Sample Site: **JHC RCRA GW Monitoring - Pond A AMP-HMP (395496)**
 Field Sample ID: **FB-04**
 Lab Sample ID: 20-1195-08
 Matrix: Water

Laboratory Project: **20-1195**
 Collect Date: 10/22/2020
 Collect Time: 07:11 PM

Mercury by EPA 7470A, Total, Aqueous

Aliquot: 20-1195-08-C01-A01 Analyst: SLK

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Mercury	ND		ug/L	0.2	10/29/2020	AB20-1029-04

Metals by EPA 6020; HMP/AMP Detection & Assessment Monitoring

Aliquot: 20-1195-08-C01-A02 Analyst: SLK

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Antimony	ND		ug/L	1	11/05/2020	AB20-1105-07
Arsenic	ND		ug/L	1	11/05/2020	AB20-1105-07
Barium	ND		ug/L	5	11/05/2020	AB20-1105-07
Beryllium	ND		ug/L	1	11/05/2020	AB20-1105-07
Boron	ND		ug/L	20	11/05/2020	AB20-1105-07
Cadmium	ND		ug/L	0.2	11/05/2020	AB20-1105-07
Calcium	ND		ug/L	1000	11/05/2020	AB20-1105-07
Chromium	ND		ug/L	1	11/05/2020	AB20-1105-07
Cobalt	ND		ug/L	6	11/05/2020	AB20-1105-07
Copper	ND		ug/L	1	11/05/2020	AB20-1105-07
Iron	ND		ug/L	20	11/05/2020	AB20-1105-07
Lead	ND		ug/L	1	11/05/2020	AB20-1105-07
Lithium	ND		ug/L	10	11/05/2020	AB20-1105-07
Molybdenum	ND		ug/L	5	11/05/2020	AB20-1105-07
Nickel	ND		ug/L	2	11/05/2020	AB20-1105-07
Selenium	ND		ug/L	1	11/05/2020	AB20-1105-07
Silver	ND		ug/L	0.2	11/05/2020	AB20-1105-07
Thallium	ND		ug/L	2	11/05/2020	AB20-1105-07
Vanadium	ND		ug/L	2	11/05/2020	AB20-1105-07
Zinc	ND		ug/L	10	11/05/2020	AB20-1105-07

Anions by EPA 300.0 CCR Rule Analyte List, Cl, F, SO4, Aqueous

Aliquot: 20-1195-08-C02-A01 Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Chloride	ND		ug/L	1000	10/29/2020	AB20-1029-07
Fluoride	ND		ug/L	1000	10/29/2020	AB20-1029-07
Sulfate	ND		ug/L	1000	10/29/2020	AB20-1029-07

Total Dissolved Solids by SM 2540C

Aliquot: 20-1195-08-C03-A01 Analyst: SLK

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Total Dissolved Solids	ND		mg/L	10	10/26/2020	AB20-1028-04

Laboratory Services
A CENTURY OF EXCELLENCE

Sample Site: **JHC RCRA GW Monitoring - Pond A AMP-HMP (395496)**
 Field Sample ID: **EB-04**
 Lab Sample ID: 20-1195-09
 Matrix: Water

Laboratory Project: **20-1195**
 Collect Date: 10/22/2020
 Collect Time: 07:11 PM

Mercury by EPA 7470A, Total, Aqueous

Aliquot: 20-1195-09-C01-A01

Analyst: SLK

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Mercury	ND		ug/L	0.2	10/29/2020	AB20-1029-04

Metals by EPA 6020; HMP/AMP Detection & Assessment Monitoring

Aliquot: 20-1195-09-C01-A02

Analyst: SLK

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Antimony	ND		ug/L	1	11/05/2020	AB20-1105-07
Arsenic	ND		ug/L	1	11/05/2020	AB20-1105-07
Barium	ND		ug/L	5	11/05/2020	AB20-1105-07
Beryllium	ND		ug/L	1	11/05/2020	AB20-1105-07
Boron	ND		ug/L	20	11/05/2020	AB20-1105-07
Cadmium	ND		ug/L	0.2	11/05/2020	AB20-1105-07
Calcium	ND		ug/L	1000	11/05/2020	AB20-1105-07
Chromium	ND		ug/L	1	11/05/2020	AB20-1105-07
Cobalt	ND		ug/L	6	11/05/2020	AB20-1105-07
Copper	ND		ug/L	1	11/05/2020	AB20-1105-07
Iron	ND		ug/L	20	11/05/2020	AB20-1105-07
Lead	ND		ug/L	1	11/05/2020	AB20-1105-07
Lithium	ND		ug/L	10	11/05/2020	AB20-1105-07
Molybdenum	ND		ug/L	5	11/05/2020	AB20-1105-07
Nickel	ND		ug/L	2	11/05/2020	AB20-1105-07
Selenium	ND		ug/L	1	11/05/2020	AB20-1105-07
Silver	ND		ug/L	0.2	11/05/2020	AB20-1105-07
Thallium	ND		ug/L	2	11/05/2020	AB20-1105-07
Vanadium	ND		ug/L	2	11/05/2020	AB20-1105-07
Zinc	ND		ug/L	10	11/05/2020	AB20-1105-07

Anions by EPA 300.0 CCR Rule Analyte List, Cl, F, SO4, Aqueous

Aliquot: 20-1195-09-C02-A01

Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Chloride	ND		ug/L	1000	10/29/2020	AB20-1029-07
Fluoride	ND		ug/L	1000	10/29/2020	AB20-1029-07
Sulfate	ND		ug/L	1000	10/29/2020	AB20-1029-07

Total Dissolved Solids by SM 2540C

Aliquot: 20-1195-09-C03-A01

Analyst: SLK

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Total Dissolved Solids	ND		mg/L	10	10/26/2020	AB20-1028-04



Analytical Report

Report Date: 11/11/20

Laboratory Services
A CENTURY OF EXCELLENCE

Data Qualifiers	Exception Summary
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No exceptions occurred.

CONSUMERS
ENERGY

Chemistry Department
General Standard Operating Procedure

PROC CHEM-1.2.01
PAGE 1 OF 2
REVISION 3
ATTACHMENT A

TITLE: SAMPLE LOG-IN – SHIPMENT INSPECTION FORM

Project Log-In Number: 20-1195
Inspection Date: 10/26/20 Inspection By: SLK / TMR
Sample Origin/Project Name: JCN QA

Shipment Delivered By: Enter the type of shipment carrier.

Pony _____ FedEx _____ UPS _____ USPS _____ Airborne _____
Other/Hand Carry (whom) X BMW / CET CONSUMERS
Tracking Number: SLK 10/26/20 Shipping Form Attached: Yes _____ No _____

Shipping Containers: Enter the type and number of shipping containers received.

Cooler 1 Cardboard Box _____ Custom Case _____ Envelope/Mailer _____
Loose/Unpackaged Containers _____ Other _____

Condition of Shipment: Enter the as-received condition of the shipment container.

Damaged Shipment Observed: None X Dented _____ Leaking _____
Other _____

Shipment Security: Enter if any of the shipping containers were opened before receipt.

Shipping Containers Received: Opened _____ Sealed X

Enclosed Documents: Enter the type of documents enclosed with the shipment.

CoC 7 Work Request _____ Air Data Sheet _____ Other _____

Temperature of Containers: Measure the temperature of several sample containers.

As-Received Temperature Range 4.6-5.0 Samples Received on Ice: Yes X No _____

M&TE # and Expiration 015402 / 06/04/21

Number and Type of Containers: Enter the total number of sample containers received.

Container Type	Water	Soil	Other	Broken	Leaking
VOA (40mL or 60mL)	_____	_____	_____	_____	_____
Quart/Liter (g/p)	_____	_____	_____	_____	_____
9-oz (amber glass jar)	_____	_____	_____	_____	_____
2-oz (amber glass)	_____	_____	_____	_____	_____
125 mL (plastic)	<u>12</u>	_____	_____	_____	_____
24 mL vial (glass)	_____	_____	_____	_____	_____
500 mL (plastic)	_____	_____	_____	_____	_____
Other <u>250mL plastic</u>	<u>6</u>	_____	_____	_____	_____
<u>1000mL plastic</u>	<u>12</u>	_____	_____	_____	_____

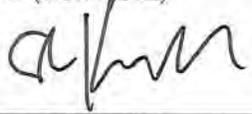
page 2 of 2 not needed

CHAIN OF CUSTODY

CONSUMERS ENERGY COMPANY – LABORATORY SERVICES



135 WEST TRAIL ST., JACKSON, MI 49201 • (517) 788-1251 • FAX (517) 788-2533

SAMPLING SITE: JHC Q4-2020 RCRA GW Monitoring Pond A Wells				PROJECT NUMBER: 20-1195			ANALYSIS REQUESTED				PAGE 1 OF 1		
SAMPLING TEAM: CET / DMW				DATE SHIPPED		SITE SKETCHED ATTACHED? CIRCLE ONE: NO		Metals, Total	Anions	TDS	Radium	SEND REPORT TO: Caleb Batts	
PHONE: _____													
CE CONTROL #	SAMPLE DATE	SAMPLE TIME	SAMPLE MATRIX	SAMPLE DESCRIPTION / LOCATION	DEPTH	# OF CONTAINERS						REMARKS	
20-1195-01	10-22-20	1737	GW	JHC-MW-15006	--	5	X	X	X	X			
-02	10-22-20	DRY	GW	JHC-MW-15007	--	5	X	X	X	X		DRY	
-03	10-22-20	1612 1737	GW	JHC-MW-15008R	--	5	X	X	X	X			
-04	10-22-20	DRY	GW	JHC-MW-15009	--	5	X	X	X	X		DRY	
-05	10-22-20	DRY	GW	JHC-MW-15010	--	5	X	X	X	X		Dry/low volume	
-06	10-22-20	1650	GW	JHC-MW-15011	--	5	X	X	X	X			
-07	10-22-20	1737	GW	DUP-04	--	5	X	X	X	X			
-08	10-22-20	1911	GW	FB-04	--	5	X	X	X	X			
-09	10-22-20	1911	GW	EB-04	--	5	X	X	X	X			
RELINQUISHED BY: (SIGNATURE)				DATE/TIME		RECEIVED BY: (SIGNATURE)				COMMENTS			
				10/26/20 1040									
RELINQUISHED BY: (SIGNATURE)				DATE/TIME:		RECEIVED BY: (SIGNATURE)				ORIGINAL TO LAB COPY TO CUSTOMER			

To: CDBatts, JH Campbell Complex

From: EBlaj, T-258

Date: November 11, 2020

Subject: JH CAMPBELL SOLID WASTE DISPOSAL AREA – GROUNDWATER MONITORING
4th Quarter, 2020 – Pond A GSI Wells

CC: BLSwanberg, P22-119
BTRunkel, P22-120
HDRegister, P22-521

Sarah Holmstrom, Project Manager
TRC Companies, Inc.
1540 Eisenhower Place
Ann Arbor, MI 48108

Chemistry Project: 20-1197

CE Laboratory Services conducted groundwater monitoring on 10/19/2020 through 10/23/2020 at the JH Campbell Solid Waste Disposal Area, for the 4th Quarter monitoring requirements. Samples were not collected from MW-13 due to well being dry. All other samples were received for analysis by the Chemistry department on 10/26/2020.

The report that follows presents the results of the requested analytical testing; the results apply only to the samples, as received. All samples have been analyzed in accordance with the 2016 TNI Standard and the applicable A2LA accreditation scope for Laboratory Services. Any exceptions to applicable test method criteria and standard compliance are noted in the Case Narrative, or flagged with applicable qualifiers in the analytical results section.

Reviewed and approved by:

Emil Blaj
Sr. Technical Analyst
Project Lead



Testing performed in accordance with the A2LA scope of accreditation specified in the listed certificate. The information contained in this report is the sole property of Consumers Energy. It cannot be reproduced except in full, and with consent from Consumers Energy, or the customer for which this report was issued.

CASE NARRATIVE

I. Sample Receipt

All samples were received within hold time and in good conditions; no anomalies were noted on the Sample Log-In Shipment Inspection Form during sample check-in. Identification of all samples included in the work order/project is provided in the sample summary section. Sample preservation upon receipt was verified by the sample custodian and confirmed to meet method requirements.

II. Methodology

Unless otherwise indicated, sample preparation and analysis was performed in accordance with the corresponding test methods from “Methods for the Determination of Inorganic Substances in Environmental Samples (EPA/600/R-93/100); SW-846, “Test Methods for Evaluating Solid Waste – Physical/Chemical Methods”, USEPA (latest revisions), and Standard Methods for the Examination of Water and Wastewater, APHA-AWWA-WPCF, 22nd Edition, 2012.

III. Results/Quality Control

Analytical results for this report are presented by laboratory sample ID, container & aliquot number. Results for the field blanks, field duplicates, and percent recoveries of the field matrix spike & matrix spike duplicate samples are included in the results section. Unless specifically noted in the case narrative, all method quality control requirements have been met. If any results are qualified, the corresponding data flags/qualifiers are listed on the last page of the results section. Any additional information on method performance, when applicable, is presented in this section of the case narrative. When data flags are not needed, the qualifiers text box on the last page is left blank, and a statement confirms that no exceptions occurred.

DEFINITIONS / QUALIFIERS

The following qualifiers and/or acronyms are used in the report where applicable:

<u>Acronym</u>	<u>Description</u>
RL	Reporting Limit
ND	Result not detected or below Reporting Limit
NT	Not a TNI Analyte
LCS	Laboratory Control Sample
LRB	Laboratory Reagent Blank (also referred to as Method Blank)
DUP	Duplicate
MS	Matrix Spike
MSD	Matrix Spike Duplicate
RPD	Relative Percent Difference
MDL	Method Detection Limit
PQL	Practical Quantitation Limit
TDL	Target Detection Limit
SM	Standard Methods Compendium

<u>Qualifier</u>	<u>Description</u>
*	Generic data flag, applicable description added in the corresponding notes section
B	The analyte was detected in the LRB at a level which is significant relative to sample result

D	Reporting limit elevated due to dilution
E	Estimated due to result exceeding the linear range of the analyzer
H	The maximum recommended hold time was exceeded
I	Dilution required due to matrix interference; reporting limit elevated
J	Estimated due to result found above MDL but below PQL (or RL)
K	Reporting limit raised due to matrix interference
M	The precision for duplicate analysis was not met; RPD outside acceptance criteria
N	Non-homogeneous sample made analysis questionable
PI	Possible interference may have affected the accuracy of the laboratory result
Q	Matrix Spike or Matrix Spike Duplicate recovery outside acceptance criteria
R	Result confirmed by new sample preparation and reanalysis
X	Other notation required; comment listed in sample notes and/or case narrative

Work Order Sample Summary

Customer Name: JH Campbell Complex
Work Order ID: Q4-2020 RCRA GW Monitoring N&E / AMP / GSI / Supplemental
Date Received: 10/26/2020
Chemistry Project: 20-1197

<u>Sample #</u>	<u>Field Sample ID</u>	<u>Matrix</u>	<u>Sample Date</u>	<u>Site</u>
20-1197-01	MW-14S	Groundwater	10/20/2020 05:47 PM	JHC RCRA GW Monitoring - N&E/AMP/GSI Wells
20-1197-02	PZ-24S	Groundwater	10/21/2020 12:44 PM	JHC RCRA GW Monitoring - N&E/AMP/GSI Wells
20-1197-03	PZ-40S	Groundwater	10/21/2020 09:54 AM	JHC RCRA GW Monitoring - N&E/AMP/GSI Wells
20-1197-04	TW-19-04A	Groundwater	10/21/2020 06:01 PM	JHC RCRA GW Monitoring - N&E/AMP/GSI Wells
20-1197-05	TW-19-05	Groundwater	10/21/2020 04:32 PM	JHC RCRA GW Monitoring - N&E/AMP/GSI Wells
20-1197-06	TW-19-06A	Groundwater	10/21/2020 05:21 PM	JHC RCRA GW Monitoring - N&E/AMP/GSI Wells
20-1197-07	DUP-08	Groundwater	10/20/2020 12:00 AM	JHC RCRA GW Monitoring - N&E/AMP/GSI Wells
20-1197-08	FB-08	Water	10/21/2020 05:48 PM	JHC RCRA GW Monitoring - N&E/AMP/GSI Wells
20-1197-09	EB-08	Water	10/21/2020 06:25 PM	JHC RCRA GW Monitoring - N&E/AMP/GSI Wells
20-1197-10	TW-19-04A Field MS	Groundwater	10/21/2020 06:01 PM	JHC RCRA GW Monitoring - N&E/AMP/GSI Wells
20-1197-11	TW-19-04A Field MSD	Groundwater	10/21/2020 06:01 PM	JHC RCRA GW Monitoring - N&E/AMP/GSI Wells
20-1197-12	PZ-23S	Groundwater	10/21/2020 02:21 PM	JHC RCRA GW Monitoring - N&E/AMP/GSI Wells
20-1197-13	PZ-24	Groundwater	10/21/2020 11:09 AM	JHC RCRA GW Monitoring - N&E/AMP/GSI Wells
20-1197-14	PZ-40	Groundwater	10/21/2020 08:50 AM	JHC RCRA GW Monitoring - N&E/AMP/GSI Wells
20-1197-15	DUP-09	Groundwater	10/21/2020 12:00 AM	JHC RCRA GW Monitoring - N&E/AMP/GSI Wells
20-1197-16	MW-9AR	Groundwater	10/21/2020 03:22 PM	JHC RCRA GW Monitoring - N&E/AMP/GSI Wells
20-1197-17	MW-10AR	Well dry, sample not collected		JHC RCRA GW Monitoring - N&E/AMP/GSI Wells



Analytical Report

Report Date: 11/11/20

Laboratory Services A CENTURY OF EXCELLENCE

Sample Site: **JHC RCRA GW Monitoring - N&E/AMP/GSI Wells (395496)**
Field Sample ID: **MW-14S**
Lab Sample ID: 20-1197-01
Matrix: Groundwater

Laboratory Project: **20-1197**
Collect Date: 10/20/2020
Collect Time: 05:47 PM

Metals by EPA 6020; HMP/AMP Detection & Assessment Monitoring

Aliquot: 20-1197-01-C01-A02

Analyst: SLK

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Antimony	ND		ug/L	1	11/05/2020	AB20-1105-07
Arsenic	ND		ug/L	1	11/05/2020	AB20-1105-07
Barium	8		ug/L	5	11/05/2020	AB20-1105-07
Chromium	ND		ug/L	1	11/05/2020	AB20-1105-07
Lithium	ND		ug/L	10	11/05/2020	AB20-1105-07
Molybdenum	ND		ug/L	5	11/05/2020	AB20-1105-07
Selenium	ND		ug/L	1	11/05/2020	AB20-1105-07
Vanadium	ND		ug/L	2	11/05/2020	AB20-1105-07



Analytical Report

Report Date: 11/11/20

Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **JHC RCRA GW Monitoring - N&E/AMP/GSI Wells (395496)**
Field Sample ID: **PZ-24S**
Lab Sample ID: 20-1197-02
Matrix: Groundwater

Laboratory Project: **20-1197**
Collect Date: 10/21/2020
Collect Time: 12:44 PM

Metals by EPA 6020; HMP/AMP Detection & Assessment Monitoring

Aliquot: 20-1197-02-C01-A02

Analyst: SLK

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Antimony	ND		ug/L	1	11/05/2020	AB20-1105-07
Arsenic	1		ug/L	1	11/05/2020	AB20-1105-07
Barium	32		ug/L	5	11/05/2020	AB20-1105-07
Chromium	1		ug/L	1	11/05/2020	AB20-1105-07
Lithium	ND		ug/L	10	11/05/2020	AB20-1105-07
Molybdenum	ND		ug/L	5	11/05/2020	AB20-1105-07
Selenium	ND		ug/L	1	11/05/2020	AB20-1105-07
Vanadium	3		ug/L	2	11/05/2020	AB20-1105-07



Analytical Report

Report Date: 11/11/20

Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **JHC RCRA GW Monitoring - N&E/AMP/GSI Wells (395496)**
Field Sample ID: **PZ-40S**
Lab Sample ID: 20-1197-03
Matrix: Groundwater

Laboratory Project: **20-1197**
Collect Date: 10/21/2020
Collect Time: 09:54 AM

Metals by EPA 6020; HMP/AMP Detection & Assessment Monitoring

Aliquot: 20-1197-03-C01-A02

Analyst: SLK

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Antimony	ND		ug/L	1	11/05/2020	AB20-1105-07
Arsenic	ND		ug/L	1	11/05/2020	AB20-1105-07
Barium	19		ug/L	5	11/05/2020	AB20-1105-07
Chromium	2		ug/L	1	11/05/2020	AB20-1105-07
Lithium	ND		ug/L	10	11/05/2020	AB20-1105-07
Molybdenum	ND		ug/L	5	11/05/2020	AB20-1105-07
Selenium	ND		ug/L	1	11/05/2020	AB20-1105-07
Vanadium	ND		ug/L	2	11/05/2020	AB20-1105-07

Data Qualifiers	Exception Summary
-----------------	-------------------

No exceptions occurred.

TITLE: SAMPLE LOG-IN – SHIPMENT INSPECTION FORM

Project Log-In Number: 20-1197

Inspection Date: 10/26/20 Inspection By: SK

Sample Origin/Project Name: JCN Q4

Shipment Delivered By: Enter the type of shipment carrier.

Pony _____ FedEx _____ UPS _____ USPS _____ Airborne _____
Other/Hard Carry (whom) DMW/LET-CONSUMERS
Tracking Number: _____ Shipping Form Attached: Yes _____ No _____

Shipping Containers: Enter the type and number of shipping containers received.

Cooler 1 Cardboard Box _____ Custom Case _____ Envelope/Mailer _____
Loose/Unpackaged Containers _____ Other _____

Condition of Shipment: Enter the as-received condition of the shipment container.

Damaged Shipment Observed: None X Dented _____ Leaking _____
Other _____

Shipment Security: Enter if any of the shipping containers were opened before receipt.

Shipping Containers Received: Opened _____ Sealed X

Enclosed Documents: Enter the type of documents enclosed with the shipment.

CoC X Work Request _____ Air Data Sheet _____ Other _____

Temperature of Containers: Measure the temperature of several sample containers.

As-Received Temperature Range 4.2-5.1 Samples Received on Ice: Yes X No _____

M&TE # and Expiration 015402 / 06/04/21

Number and Type of Containers: Enter the total number of sample containers received.

Container Type	Water	Soil	Other	Broken	Leaking
VOA (40mL or 60mL)	_____	_____	_____	_____	_____
Quart/Liter (g/p)	_____	_____	_____	_____	_____
9-oz (amber glass jar)	_____	_____	_____	_____	_____
2-oz (amber glass)	_____	_____	_____	_____	_____
125 mL (plastic)	_____	_____	_____	_____	_____
24 mL vial (glass)	_____	_____	_____	_____	_____
500 mL (plastic)	_____	_____	_____	_____	_____
Other <u>250mL plastic</u>	<u>13</u>	_____	_____	_____	_____

1000mL plastic

20

page 2 of 2 not needed

CHAIN OF CUSTODY

CONSUMERS ENERGY COMPANY – LABORATORY SERVICES



135 WEST TRAIL ST., JACKSON, MI 49201 • (517) 788-1251 • FAX (517) 788-2533

SAMPLING SITE: JHC Q4-2020 RCRA GW Monitoring N&E / AMP / GSI Wells				PROJECT NUMBER: 20-1197			ANALYSIS REQUESTED				PAGE 1 OF 2	
SAMPLING TEAM: CET / DMW				DATE SHIPPED		SITE SKETCHED ATTACHED? CIRCLE ONE: NO		Metals, Total	Anions	TDS	Radium	SEND REPORT TO: Caleb Batts
PHONE: _____												
CE CONTROL #	SAMPLE DATE	SAMPLE TIME	SAMPLE MATRIX	SAMPLE DESCRIPTION / LOCATION	DEPTH	# OF CONTAINERS						REMARKS
20-1197-01	10-20-20	1747	GW	MW-14S	--	5	X	X	X	X		
-02	10-21-20	1244	GW	PZ-24S	--	5	X	X	X	X		
-03	10-21-20	0954	GW	PZ-40S	--	5	X	X	X	X		
-04	10-21-20	1801 1721 dmw 10-21-20	GW	TW-19-04A	--	5	X	X	X	X		
-05	10-21-20	1632	GW	TW-19-05	--	5	X	X	X	X		
-06	10-21-20	1721	GW	TW-19-06A	--	5	X	X	X	X		
-07	10-20-20 10-21-20	—	GW	DUP-08	--	5	X	X	X	X		
-08	dmw 11-10-20	1748	GW	FB-08	--	5	X	X	X	X		
-09	↓	1825	GW	EB-08		5	X	X	X	X		
-10	10-21-20	1801	GW	TW-19-04A Field MS		2	X	X				
↓	↓	↓	AQ	TW-19-04A Field MSD		2	X	X				
RELINQUISHED BY: (SIGNATURE) 				DATE/TIME 10/26/20 1040		RECEIVED BY: (SIGNATURE) 				COMMENTS Total Metals = HMP-AMP List Metals and Mercury (01-11)		
RELINQUISHED BY: (SIGNATURE)				DATE/TIME:		RECEIVED BY: (SIGNATURE)				ORIGINAL TO LAB COPY TO CUSTOMER		

CHAIN OF CUSTODY

CONSUMERS ENERGY COMPANY – LABORATORY SERVICES



135 WEST TRAIL ST., JACKSON, MI 49201 • (517) 788-1251 • FAX (517) 788-2533

SAMPLING SITE: JHC Q4-2020 RCRA GW Monitoring N&E / AMP / Supplemental				PROJECT NUMBER: 20-1197			ANALYSIS REQUESTED					PAGE 2 OF 2 SEND REPORT TO: Caleb Batts		
SAMPLING TEAM: CET / DMW				DATE SHIPPED		SITE SKETCHED ATTACHED? CIRCLE ONE: NO		Metals, Total	Anions	TDS	Radium	Metals, Dissolved	Beth Swanberg, TRC	
													PHONE: _____	
CE CONTROL #	SAMPLE DATE	SAMPLE TIME	SAMPLE MATRIX	SAMPLE DESCRIPTION / LOCATION	DEPTH	# OF CONTAINERS								
20-1197-12	10.21.20	1421	GW	PZ-23S			X	X	X	X				
-13	10.21.20	1109	GW	PZ-24			X	X	X	X				
-14	10.21.20	0850	GW	PZ-40			X	X	X	X				
-15	10.21.20	—	GW	DUP-09			X	X	X	X				
-16	10.21.20	1522	GW	MW-9AR			X				X			
-17			GW	MW-10AR			X				X			Dry
RELINQUISHED BY: (SIGNATURE) 				DATE/TIME 10/26/20 1040		RECEIVED BY: (SIGNATURE) 				COMMENTS Total Metals = Appendix III-IV List Metals and Mercury (12-15) Total Metals = JHC GW List (16-17)				
RELINQUISHED BY: (SIGNATURE)				DATE/TIME:		RECEIVED BY: (SIGNATURE)				ORIGINAL TO LAB COPY TO CUSTOMER				

ANALYTICAL REPORT

Eurofins TestAmerica, St. Louis
13715 Rider Trail North
Earth City, MO 63045
Tel: (314)298-8566

Laboratory Job ID: 160-40221-1
Client Project/Site: JH Campbell Pond A Wells

For:
Consumers Energy
135 W Trail Street
Jackson, Michigan 49201

Attn: Emil Blaj

Elizabeth M. Hoerchler

Authorized for release by:
1/13/2021 5:50:19 PM
Elizabeth Hoerchler, Project Manager I
Elizabeth.Hoerchler@Eurofinset.com

Designee for
Jayna Awalt, Project Manager II
(314)298-8566
Jayna.Awalt@Eurofinset.com

LINKS

Review your project
results through
TotalAccess

Have a Question?



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www.eurofinsus.com/Env

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.



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Case Narrative

Client: Consumers Energy
Project/Site: JH Campbell Pond A Wells

Job ID: 160-40221-1

Job ID: 160-40221-1

Laboratory: Eurofins TestAmerica, St. Louis

Narrative

CASE NARRATIVE

Client: Consumers Energy

Project: JH Campbell Pond A Wells

Report Number: 160-40221-1

With the exceptions noted as flags or footnotes, standard analytical protocols were followed in the analysis of the samples and no problems were encountered or anomalies observed. In addition all laboratory quality control samples were within established control limits, with any exceptions noted below. Each sample was analyzed to achieve the lowest possible reporting limit within the constraints of the method. In some cases, due to interference or analytes present at high concentrations, samples were diluted. For diluted samples, the reporting limits are adjusted relative to the dilution required.

Eurofins TestAmerica, St. Louis attests to the validity of the laboratory data generated by Eurofins TestAmerica facilities reported herein. All analyses performed by Eurofins TestAmerica facilities were done using established laboratory SOPs that incorporate QA/QC procedures described in the application methods. Eurofins TestAmerica's operations groups have reviewed the data for compliance with the laboratory QA/QC plan, and data have been found to be compliant with laboratory protocols unless otherwise noted below.

The test results in this report meet all NELAP requirements for parameters for which accreditation is required or available. Any exceptions to NELAP requirements are noted in this report. Pursuant to NELAP, this report may not be reproduced, except in full, without the written approval of the laboratory.

Calculations are performed before rounding to avoid round-off errors in calculated results.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the individual sections below.

All solid sample results for Chemistry analyses are reported on an "as received" basis unless otherwise indicated by the presence of a % solids value in the method header. All soil/sediment sample results for radiochemistry analyses are based upon sample as dried and disaggregated with the exception of tritium, carbon-14, and iodine-129 by gamma spectroscopy unless requested as wet weight by the client.

Any minimum detectable concentration (MDC), critical value (DLC), or Safe Drinking Water Act detection limit (SDWA DL) is sample-specific unless otherwise stated elsewhere in this narrative.

Radiochemistry sample results are reported with the count date/time applied as the Activity Reference Date.

Reference the chain of custody and condition upon receipt report for any variations on receipt conditions and temperature of samples on receipt.

Manual Integrations were performed only when necessary and are in compliance with the laboratory's standard operating procedure. Detailed information can be found in the raw data section of the level IV report.

This laboratory report is confidential and is intended for the sole use of Eurofins TestAmerica and its client.

RECEIPT

The samples were received on 11/02/2020; the samples arrived in good condition, properly preserved. The temperature of the coolers at receipt was 13.6° C.

RADIUM 226 AS TOTAL ALPHA RADIUM

Case Narrative

Client: Consumers Energy
Project/Site: JH Campbell Pond A Wells

Job ID: 160-40221-1

Job ID: 160-40221-1 (Continued)

Laboratory: Eurofins TestAmerica, St. Louis (Continued)

Samples JHC-MW-15006 (160-40221-1), JHC-MW-15008R (160-40221-2), JHC-MW-15011 (160-40221-3), DUP-04 (160-40221-4), FB-04 (160-40221-5) and EB-04 (160-40221-6) were analyzed for Radium 226 as Total Alpha Radium in accordance with EPA 903.0_TotAl Alpha Radium. The samples were prepared on 11/24/2020 and analyzed on 12/23/2020.

Insufficient sample volume was available to perform a sample duplicate for the following samples: JHC-MW-15006 (160-40221-1), JHC-MW-15008R (160-40221-2), JHC-MW-15011 (160-40221-3), DUP-04 (160-40221-4), FB-04 (160-40221-5) and EB-04 (160-40221-6). A laboratory control sample/ laboratory control sample duplicate (LCS/LCSD) were prepared instead to demonstrate batch precision.

The Barium carrier recovery is outside the upper control limit (110%) for the following samples: JHC-MW-15006 (160-40221-1), JHC-MW-15008R (160-40221-2), JHC-MW-15011 (160-40221-3), FB-04 (160-40221-5) and EB-04 (160-40221-6). Samples turned brown on hot plate and weighed over the 110% threshold.

The LCS for Ra226 was outside the upper QC limit (132%). The LCSD was within control limits and the precision (RER/RPD) were acceptable. Additionally the activity in the associated samples was below the reporting limit indicating no adverse effect from the potential high bias. Original results will be reported. (LCS 160-490013/1-A)

The Barium recovery is above the 110% QC limit for the QC and client samples. The client requested the samples be reported without a native barium calculation applied. The LCS/LCSD spike recovery is within control limits, which demonstrates acceptable sample preparation and instrument performance. As such, this was an apparent anomaly in the sample preparation. which did not affect the sample results. The associated samples have been truncated to 100% in order to minimize any potential bias a high carrier recovery may have on the results. JHC-MW-15006 (160-40221-1), JHC-MW-15008R (160-40221-2), JHC-MW-15011 (160-40221-3), DUP-04 (160-40221-4), FB-04 (160-40221-5), EB-04 (160-40221-6), (LCS 160-490013/1-A), (LCSD 160-490013/2-A) and (MB 160-490013/23-A)

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

RADIUM-228 (GFPC)

Samples JHC-MW-15006 (160-40221-1), JHC-MW-15008R (160-40221-2), JHC-MW-15011 (160-40221-3), DUP-04 (160-40221-4), FB-04 (160-40221-5) and EB-04 (160-40221-6) were analyzed for Radium-228 (GFPC) in accordance with EPA 904. The samples were prepared on 11/24/2020 and analyzed on 12/22/2020.

The Barium recovery is above the 110% QC limit for the QC and client samples. The client requested the samples be reported without a native barium calculation applied. The LCS/LCSD spike recovery is within control limits, which demonstrates acceptable sample preparation and instrument performance. As such, this was an apparent anomaly in the sample preparation. which did not affect the sample results. The associated samples have been truncated to 100% in order to minimize any potential bias a high carrier recovery may have on the results. JHC-MW-15006 (160-40221-1), JHC-MW-15008R (160-40221-2), JHC-MW-15011 (160-40221-3), DUP-04 (160-40221-4), FB-04 (160-40221-5), EB-04 (160-40221-6), (LCS 160-490016/1-A), (LCSD 160-490016/2-A) and (MB 160-490016/23-A)

Insufficient sample volume was available to perform a sample duplicate for the following samples: JHC-MW-15006 (160-40221-1), JHC-MW-15008R (160-40221-2), JHC-MW-15011 (160-40221-3), DUP-04 (160-40221-4), FB-04 (160-40221-5) and EB-04 (160-40221-6). A laboratory control sample/ laboratory control sample duplicate (LCS/LCSD) were prepared instead to demonstrate batch precision.

The Barium carrier recovery is outside the upper control limit (110%) for the following samples: JHC-MW-15006 (160-40221-1), JHC-MW-15008R (160-40221-2), JHC-MW-15011 (160-40221-3), FB-04 (160-40221-5) and EB-04 (160-40221-6). Samples turned brown on hot plate and weighed over the 110% threshold.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

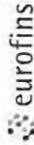
COMBINED RADIUM-226 AND RADIUM-228

Samples JHC-MW-15006 (160-40221-1), JHC-MW-15008R (160-40221-2), JHC-MW-15011 (160-40221-3), DUP-04 (160-40221-4), FB-04 (160-40221-5) and EB-04 (160-40221-6) were analyzed for Combined Radium-226 and Radium-228 in accordance with EPA 903 Radium 226/EPA 904 Radium 228. The samples were analyzed on 01/11/2021.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Chain of Custody Record

#1



Environment Testing
TestAmerica

TestAmerica Laboratories, Inc. d/b/a Eurofins TestAmerica

Regulatory Program: DW NPDES RCRA Other:

Project Manager: Emil Blaj
Email: Emil.Blaj@cmseenergy.com
Tel/Fax: 517-788-5888

Client Contact
Consumers Energy, Laboratory Services
135 W. Trail Street
Jackson, MI 49201
517-788-5888
(xxx) xxx-xxxx FAX
Project Name: JH Campbell Pond A Wells
Project #: 20-1195
P O # 4400094796

Site Contact: Bethany Swanberg
Lab Contact: Emil Blaj

Date: _____
Carrier: _____

COC No: 1 of 1 COCs
Sampler: CLH/DMW/CET
For Lab Use Only:
Walk-in Client: _____
Lab Sampling: _____
Job / SDG No.: _____

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Analysis Turnaround Time	
						CALENDAR DAYS	WORKING DAYS
JHC-MW-15006	10/22/2020	1737	G	GW	2	<input type="checkbox"/>	<input type="checkbox"/>
JHC-MW-15008R	10/22/20	1612	G	GW	2	<input checked="" type="checkbox"/>	<input type="checkbox"/>
JHC-MW-15011	10/22/20	1650	G	GW	2	<input type="checkbox"/>	<input type="checkbox"/>
DUP-04	--	--	G	GW	2	<input type="checkbox"/>	<input type="checkbox"/>
FB-04	10/22/20	1911	G	DI	2	<input type="checkbox"/>	<input type="checkbox"/>
EB-04	10/22/20	1911	G	DI	2	<input type="checkbox"/>	<input type="checkbox"/>



Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other

Possible Hazard Identification: Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample.

Special Instructions/QC Requirements & Comments:

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)

Return to Client Disposal by Lab Archive for _____ Months

Sample Specific Notes:

Perform MS / MSD (Y / N) Radium 226 (EPA 903.1) Radium 228 (EPA 904.0)

Preservative Cooler Temp. (°C): _____ Obs'd: _____

Received by: *WPS* Company: *Consumers Energy* Date/Time: *10/28/2020 10:15*

Received by: *Michael Kenning* Company: *ETA SIZ* Date/Time: *11/20/20 11:04*

Relinquished by: *Luis Burtin* Company: *WPS*



TestAmerica Michigan
10448 Citation Drive, Ste 200
Brighton, MI 48116

PROCUREMENT #: 20101220

QA Code: NQ

(Item 1) - Part Number: N/A - Quantity : 1
JHC CCR Rule GW Q4-2020 Samples

Groundwater Samples for Radium 226 (EPA 903.1) and Radium 228 (EPA 904.0)

Standard TAT Request.

Reference Quote #16009066-0

(Item 2) - Part Number: NA - Quantity : 1

Please include Consumers Energy Project Number and Procurement Number on all submitted invoices

For technical questions, please contact Emil Blaj at 517-788-5888, or Emil.Blaj@cmsenergy.com.

To expedite payment please provide the Procurement number on all invoices.

Send Invoices To:

Consumers Energy Company
Attn: Accounts Payable
135 W Trail St.
Jackson, MI 49201



Login Sample Receipt Checklist

Client: Consumers Energy

Job Number: 160-40221-1

Login Number: 40221

List Source: Eurofins TestAmerica, St. Louis

List Number: 1

Creator: Hoerchler, Elizabeth M

Question	Answer	Comment
Radioactivity wasn't checked or is \leq background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	N/A	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <math><6\text{mm}</math> (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Definitions/Glossary

Client: Consumers Energy
Project/Site: JH Campbell Pond A Wells

Job ID: 160-40221-1

Qualifiers

Rad

Qualifier	Qualifier Description
*	LCS or LCSD is outside acceptance limits.
U	Result is less than the sample detection limit.
X	Carrier is outside acceptance limits.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
α	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

Method Summary

Client: Consumers Energy
Project/Site: JH Campbell Pond A Wells

Job ID: 160-40221-1

Method	Method Description	Protocol	Laboratory
903.0	Radium-226 (GFPC)	EPA	TAL SL
904.0	Radium-228 (GFPC)	EPA	TAL SL
Ra226_Ra228	Combined Radium-226 and Radium-228	TAL-STL	TAL SL
PrecSep STD	Preparation, Precipitate Separation (Standard In-Growth)	None	TAL SL
PrecSep_0	Preparation, Precipitate Separation	None	TAL SL

Protocol References:

- EPA = US Environmental Protection Agency
- None = None
- TAL-STL = TestAmerica Laboratories, St. Louis, Facility Standard Operating Procedure.

Laboratory References:

- TAL SL = Eurofins TestAmerica, St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566



Sample Summary

Client: Consumers Energy
Project/Site: JH Campbell Pond A Wells

Job ID: 160-40221-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received	Asset ID
160-40221-1	JHC-MW-15006	Water	10/22/20 17:37	11/02/20 11:04	
160-40221-2	JHC-MW-15008R	Water	10/22/20 16:12	11/02/20 11:04	
160-40221-3	JHC-MW-15011	Water	10/22/20 16:50	11/02/20 11:04	
160-40221-4	DUP-04	Water	10/22/20 00:00	11/02/20 11:04	
160-40221-5	FB-04	Water	10/22/20 19:11	11/02/20 11:04	
160-40221-6	EB-04	Water	10/22/20 19:11	11/02/20 11:04	

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10
- 11
- 12

Client Sample Results

Client: Consumers Energy
Project/Site: JH Campbell Pond A Wells

Job ID: 160-40221-1

Client Sample ID: JHC-MW-15006

Lab Sample ID: 160-40221-1

Date Collected: 10/22/20 17:37

Matrix: Water

Date Received: 11/02/20 11:04

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.289	*	0.187	0.189	1.00	0.246	pCi/L	11/24/20 07:52	12/23/20 09:55	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	148	X	40 - 110					11/24/20 07:52	12/23/20 09:55	1

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.0292	U	0.157	0.157	1.00	0.274	pCi/L	11/24/20 08:31	12/22/20 08:32	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	148	X	40 - 110					11/24/20 08:31	12/22/20 08:32	1
Y Carrier	85.2		40 - 110					11/24/20 08:31	12/22/20 08:32	1

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.318		0.244	0.246	5.00	0.274	pCi/L		01/11/21 21:18	1

Client Sample ID: JHC-MW-15008R

Lab Sample ID: 160-40221-2

Date Collected: 10/22/20 16:12

Matrix: Water

Date Received: 11/02/20 11:04

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.553	*	0.265	0.270	1.00	0.316	pCi/L	11/24/20 07:52	12/23/20 09:55	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	121	X	40 - 110					11/24/20 07:52	12/23/20 09:55	1

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.330		0.213	0.215	1.00	0.328	pCi/L	11/24/20 08:31	12/22/20 08:32	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	121	X	40 - 110					11/24/20 08:31	12/22/20 08:32	1
Y Carrier	80.0		40 - 110					11/24/20 08:31	12/22/20 08:32	1

Client Sample Results

Client: Consumers Energy
Project/Site: JH Campbell Pond A Wells

Job ID: 160-40221-1

Client Sample ID: JHC-MW-15008R

Lab Sample ID: 160-40221-2

Date Collected: 10/22/20 16:12

Matrix: Water

Date Received: 11/02/20 11:04

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.883		0.340	0.345	5.00	0.328	pCi/L		01/11/21 21:18	1

Client Sample ID: JHC-MW-15011

Lab Sample ID: 160-40221-3

Date Collected: 10/22/20 16:50

Matrix: Water

Date Received: 11/02/20 11:04

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.344	*	0.234	0.236	1.00	0.332	pCi/L	11/24/20 07:52	12/23/20 09:55	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	132	X	40 - 110					11/24/20 07:52	12/23/20 09:55	1

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.153	U	0.162	0.162	1.00	0.264	pCi/L	11/24/20 08:31	12/22/20 08:32	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	132	X	40 - 110					11/24/20 08:31	12/22/20 08:32	1
Y Carrier	92.7		40 - 110					11/24/20 08:31	12/22/20 08:32	1

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.497		0.285	0.286	5.00	0.332	pCi/L		01/11/21 21:18	1

Client Sample ID: DUP-04

Lab Sample ID: 160-40221-4

Date Collected: 10/22/20 00:00

Matrix: Water

Date Received: 11/02/20 11:04

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.274	U *	0.231	0.232	1.00	0.345	pCi/L	11/24/20 07:52	12/23/20 09:55	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	101		40 - 110					11/24/20 07:52	12/23/20 09:55	1

Client Sample Results

Client: Consumers Energy
Project/Site: JH Campbell Pond A Wells

Job ID: 160-40221-1

Client Sample ID: DUP-04

Lab Sample ID: 160-40221-4

Date Collected: 10/22/20 00:00

Matrix: Water

Date Received: 11/02/20 11:04

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.179	U	0.239	0.240	1.00	0.399	pCi/L	11/24/20 08:31	12/22/20 08:33	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	101		40 - 110					11/24/20 08:31	12/22/20 08:33	1
Y Carrier	77.0		40 - 110					11/24/20 08:31	12/22/20 08:33	1

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.453		0.332	0.334	5.00	0.399	pCi/L		01/11/21 21:18	1

Client Sample ID: FB-04

Lab Sample ID: 160-40221-5

Date Collected: 10/22/20 19:11

Matrix: Water

Date Received: 11/02/20 11:04

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	-0.0460	U *	0.106	0.107	1.00	0.252	pCi/L	11/24/20 07:52	12/23/20 09:55	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	169	X	40 - 110					11/24/20 07:52	12/23/20 09:55	1

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.0446	U	0.135	0.135	1.00	0.234	pCi/L	11/24/20 08:31	12/22/20 08:33	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	169	X	40 - 110					11/24/20 08:31	12/22/20 08:33	1
Y Carrier	86.7		40 - 110					11/24/20 08:31	12/22/20 08:33	1

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	-0.00135	U	0.172	0.172	5.00	0.252	pCi/L		01/11/21 21:18	1

Client Sample Results

Client: Consumers Energy
Project/Site: JH Campbell Pond A Wells

Job ID: 160-40221-1

Client Sample ID: EB-04

Lab Sample ID: 160-40221-6

Date Collected: 10/22/20 19:11

Matrix: Water

Date Received: 11/02/20 11:04

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.105	U *	0.202	0.202	1.00	0.355	pCi/L	11/24/20 07:52	12/23/20 09:56	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	132	X	40 - 110					11/24/20 07:52	12/23/20 09:56	1

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	-0.122	U	0.155	0.155	1.00	0.295	pCi/L	11/24/20 08:31	12/22/20 08:33	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	132	X	40 - 110					11/24/20 08:31	12/22/20 08:33	1
Y Carrier	87.1		40 - 110					11/24/20 08:31	12/22/20 08:33	1

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	-0.0173	U	0.255	0.255	5.00	0.355	pCi/L		01/11/21 21:18	1

QC Sample Results

Client: Consumers Energy
Project/Site: JH Campbell Pond A Wells

Job ID: 160-40221-1

Method: 903.0 - Radium-226 (GFPC)

Lab Sample ID: MB 160-490013/23-A
Matrix: Water
Analysis Batch: 492889

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 490013

Analyte	MB MB		Count	Total	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
	Result	Qualifier	Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Radium-226	-0.08283	U	0.124	0.124	1.00	0.300	pCi/L	11/24/20 07:52	12/23/20 12:08	1
Carrier	MB %Yield	MB Qualifier	Limits		Prepared	Analyzed	Dil Fac			
Ba Carrier	137	X	40 - 110					11/24/20 07:52	12/23/20 12:08	1

Lab Sample ID: LCS 160-490013/1-A
Matrix: Water
Analysis Batch: 492889

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 490013

Analyte	Spike Added	LCS Result	LCS Qual	Total	RL	MDC	Unit	%Rec	%Rec. Limits
				Uncert. (2σ+/-)					
Radium-226	11.3	15.03	*	1.87	1.00	0.379	pCi/L	132	75 - 125
Carrier	LCS %Yield	LCS Qualifier	Limits						
Ba Carrier	78.2		40 - 110						

Lab Sample ID: LCSD 160-490013/2-A
Matrix: Water
Analysis Batch: 492889

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 490013

Analyte	Spike Added	LCSD Result	LCSD Qual	Total	RL	MDC	Unit	%Rec	%Rec. Limits	RER	RER
				Uncert. (2σ+/-)							Limit
Radium-226	11.3	12.75		1.59	1.00	0.360	pCi/L	112	75 - 125	0.66	1
Carrier	LCSD %Yield	LCSD Qualifier	Limits								
Ba Carrier	104		40 - 110								

Method: 904.0 - Radium-228 (GFPC)

Lab Sample ID: MB 160-490016/23-A
Matrix: Water
Analysis Batch: 492806

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 490016

Analyte	MB MB		Count	Total	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
	Result	Qualifier	Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Radium-228	0.2258	U	0.171	0.172	1.00	0.269	pCi/L	11/24/20 08:31	12/22/20 08:31	1
Carrier	MB %Yield	MB Qualifier	Limits		Prepared	Analyzed	Dil Fac			
Ba Carrier	137	X	40 - 110					11/24/20 08:31	12/22/20 08:31	1
Y Carrier	80.0		40 - 110		11/24/20 08:31	12/22/20 08:31	1			

QC Sample Results

Client: Consumers Energy
 Project/Site: JH Campbell Pond A Wells

Job ID: 160-40221-1

Method: 904.0 - Radium-228 (GFPC) (Continued)

Lab Sample ID: LCS 160-490016/1-A
Matrix: Water
Analysis Batch: 492800

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 490016

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits	
									75	125
Radium-228	7.56	7.794		0.991	1.00	0.484	pCi/L	103	75	125
LCS LCS										
Carrier	%Yield	Qualifier	Limits							
Ba Carrier	78.2		40 - 110							
Y Carrier	85.2		40 - 110							

Lab Sample ID: LCSD 160-490016/2-A
Matrix: Water
Analysis Batch: 492800

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 490016

Analyte	Spike Added	LCSD Result	LCSD Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits		RER	Limit
									75	125	0.56	1
Radium-228	7.56	6.773		0.837	1.00	0.373	pCi/L	90	75	125	0.56	1
LCSD LCSD												
Carrier	%Yield	Qualifier	Limits									
Ba Carrier	104		40 - 110									
Y Carrier	82.6		40 - 110									

QC Association Summary

Client: Consumers Energy
 Project/Site: JH Campbell Pond A Wells

Job ID: 160-40221-1

Rad

Prep Batch: 490013

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-40221-1	JHC-MW-15006	Total/NA	Water	PrecSep STD	
160-40221-2	JHC-MW-15008R	Total/NA	Water	PrecSep STD	
160-40221-3	JHC-MW-15011	Total/NA	Water	PrecSep STD	
160-40221-4	DUP-04	Total/NA	Water	PrecSep STD	
160-40221-5	FB-04	Total/NA	Water	PrecSep STD	
160-40221-6	EB-04	Total/NA	Water	PrecSep STD	
MB 160-490013/23-A	Method Blank	Total/NA	Water	PrecSep STD	
LCS 160-490013/1-A	Lab Control Sample	Total/NA	Water	PrecSep STD	
LCSD 160-490013/2-A	Lab Control Sample Dup	Total/NA	Water	PrecSep STD	

Prep Batch: 490016

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-40221-1	JHC-MW-15006	Total/NA	Water	PrecSep_0	
160-40221-2	JHC-MW-15008R	Total/NA	Water	PrecSep_0	
160-40221-3	JHC-MW-15011	Total/NA	Water	PrecSep_0	
160-40221-4	DUP-04	Total/NA	Water	PrecSep_0	
160-40221-5	FB-04	Total/NA	Water	PrecSep_0	
160-40221-6	EB-04	Total/NA	Water	PrecSep_0	
MB 160-490016/23-A	Method Blank	Total/NA	Water	PrecSep_0	
LCS 160-490016/1-A	Lab Control Sample	Total/NA	Water	PrecSep_0	
LCSD 160-490016/2-A	Lab Control Sample Dup	Total/NA	Water	PrecSep_0	

Tracer/Carrier Summary

Client: Consumers Energy
Project/Site: JH Campbell Pond A Wells

Job ID: 160-40221-1

Method: 903.0 - Radium-226 (GFPC)

Matrix: Water

Prep Type: Total/NA

Percent Yield (Acceptance Limits)

Lab Sample ID	Client Sample ID	Ba (40-110)
160-40221-1	JHC-MW-15006	148 X
160-40221-2	JHC-MW-15008R	121 X
160-40221-3	JHC-MW-15011	132 X
160-40221-4	DUP-04	101
160-40221-5	FB-04	169 X
160-40221-6	EB-04	132 X
LCS 160-490013/1-A	Lab Control Sample	78.2
LCSD 160-490013/2-A	Lab Control Sample Dup	104
MB 160-490013/23-A	Method Blank	137 X

Tracer/Carrier Legend

Ba = Ba Carrier

Method: 904.0 - Radium-228 (GFPC)

Matrix: Water

Prep Type: Total/NA

Percent Yield (Acceptance Limits)

Lab Sample ID	Client Sample ID	Ba (40-110)	Y (40-110)
160-40221-1	JHC-MW-15006	148 X	85.2
160-40221-2	JHC-MW-15008R	121 X	80.0
160-40221-3	JHC-MW-15011	132 X	92.7
160-40221-4	DUP-04	101	77.0
160-40221-5	FB-04	169 X	86.7
160-40221-6	EB-04	132 X	87.1
LCS 160-490016/1-A	Lab Control Sample	78.2	85.2
LCSD 160-490016/2-A	Lab Control Sample Dup	104	82.6
MB 160-490016/23-A	Method Blank	137 X	80.0

Tracer/Carrier Legend

Ba = Ba Carrier

Y = Y Carrier

ANALYTICAL REPORT

Eurofins TestAmerica, St. Louis
13715 Rider Trail North
Earth City, MO 63045
Tel: (314)298-8566

Laboratory Job ID: 160-40223-1
Client Project/Site: JH Campbell Background Wells

For:
Consumers Energy
135 W Trail Street
Jackson, Michigan 49201

Attn: Emil Blaj



*Authorized for release by:
1/23/2021 9:35:04 PM*

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This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.



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Case Narrative

Client: Consumers Energy
Project/Site: JH Campbell Background Wells

Job ID: 160-40223-1

Job ID: 160-40223-1

Laboratory: Eurofins TestAmerica, St. Louis

Narrative

CASE NARRATIVE

Client: Consumers Energy

Project: JH Campbell Background Wells

Report Number: 160-40223-1

With the exceptions noted as flags or footnotes, standard analytical protocols were followed in the analysis of the samples and no problems were encountered or anomalies observed. In addition all laboratory quality control samples were within established control limits, with any exceptions noted below. Each sample was analyzed to achieve the lowest possible reporting limit within the constraints of the method. In some cases, due to interference or analytes present at high concentrations, samples were diluted. For diluted samples, the reporting limits are adjusted relative to the dilution required.

Eurofins TestAmerica, St. Louis attests to the validity of the laboratory data generated by Eurofins TestAmerica facilities reported herein. All analyses performed by Eurofins TestAmerica facilities were done using established laboratory SOPs that incorporate QA/QC procedures described in the application methods. Eurofins TestAmerica's operations groups have reviewed the data for compliance with the laboratory QA/QC plan, and data have been found to be compliant with laboratory protocols unless otherwise noted below.

The test results in this report meet all NELAP requirements for parameters for which accreditation is required or available. Any exceptions to NELAP requirements are noted in this report. Pursuant to NELAP, this report may not be reproduced, except in full, without the written approval of the laboratory.

Calculations are performed before rounding to avoid round-off errors in calculated results.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the individual sections below.

All solid sample results for Chemistry analyses are reported on an "as received" basis unless otherwise indicated by the presence of a % solids value in the method header. All soil/sediment sample results for radiochemistry analyses are based upon sample as dried and disaggregated with the exception of tritium, carbon-14, and iodine-129 by gamma spectroscopy unless requested as wet weight by the client."

Any minimum detectable concentration (MDC), critical value (DLC), or Safe Drinking Water Act detection limit (SDWA DL) is sample-specific unless otherwise stated elsewhere in this narrative.

Reference the chain of custody and condition upon receipt report for any variations on receipt conditions and temperature of samples on receipt.

Manual Integrations were performed only when necessary and are in compliance with the laboratory's standard operating procedure. Detailed information can be found in the raw data section of the level IV report.

This laboratory report is confidential and is intended for the sole use of Eurofins TestAmerica and its client.

RECEIPT

The samples were received on 11/02/2020; the samples arrived in good condition, properly preserved. The temperature of the coolers at receipt was 12.6 C.

RADIUM 226 AS TOTAL ALPHA RADIUM

Samples JHC-MW-15023 (160-40223-1), JHC-MW-15024 (160-40223-2), JHC-MW-15025 (160-40223-3), JHC-MW-15026 (160-40223-4), JHC-MW-15027 (160-40223-5), JHC-MW-15028 (160-40223-6), DUP-01 (160-40223-7), EB-01 (160-40223-8) and FB-01 (160-40223-9)

Case Narrative

Client: Consumers Energy
Project/Site: JH Campbell Background Wells

Job ID: 160-40223-1

Job ID: 160-40223-1 (Continued)

Laboratory: Eurofins TestAmerica, St. Louis (Continued)

were analyzed for Radium 226 as Total Alpha Radium in accordance with EPA 903.0_Total Alpha Radium. The samples were prepared on 11/24/2020 and 12/03/2020 and analyzed on 12/23/2020 and 12/28/2020.

Batch: 490013

Insufficient sample volume was available to perform a sample duplicate for the following samples: JHC-MW-15023 (160-40223-1), JHC-MW-15024 (160-40223-2), JHC-MW-15025 (160-40223-3), JHC-MW-15026 (160-40223-4), JHC-MW-15027 (160-40223-5) and JHC-MW-15028 (160-40223-6). A laboratory control sample/ laboratory control sample duplicate (LCS/LCSD) was prepared to demonstrate batch precision.

The LCS for Ra226 was outside the upper QC limit (132%). The LCSD was within control limits and the precision (RER/RPD) were acceptable. Additionally the activity in the associated samples was below the reporting limit indicating no adverse effect from the potential high bias. Original results will be reported. (LCS 160-490013/1-A)

The Barium recovery is above the 110% QC limit for the QC and client samples. The client requested the samples be reported without a native barium calculation applied. The LCS/LCSD spike recovery is within control limits, which demonstrates acceptable sample preparation and instrument performance. As such, this was an apparent anomaly in the sample preparation which did not affect the sample results. The associated samples have been truncated to 100% in order to minimize any potential bias a high carrier recovery may have on the results. JHC-MW-15023 (160-40223-1), JHC-MW-15024 (160-40223-2), JHC-MW-15025 (160-40223-3), JHC-MW-15026 (160-40223-4), JHC-MW-15027 (160-40223-5), JHC-MW-15028 (160-40223-6), (LCS 160-490013/1-A), (LCSD 160-490013/2-A) and (MB 160-490013/23-A)

Batch: 490781

Insufficient sample volume was available to perform a sample duplicate for the following samples: DUP-01 (160-40223-7), EB-01 (160-40223-8) and FB-01 (160-40223-9). A laboratory control sample/ laboratory control sample duplicate (LCS/LCSD) were prepared instead to demonstrate batch precision.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

RADIUM-228 (GFPC)

Samples JHC-MW-15023 (160-40223-1), JHC-MW-15024 (160-40223-2), JHC-MW-15025 (160-40223-3), JHC-MW-15026 (160-40223-4), JHC-MW-15027 (160-40223-5), JHC-MW-15028 (160-40223-6), DUP-01 (160-40223-7), EB-01 (160-40223-8) and FB-01 (160-40223-9) were analyzed for Radium-228 (GFPC) in accordance with EPA 904. The samples were prepared on 01/18/2021, 11/24/2020 and 12/03/2020 and analyzed on 01/21/2021, 12/22/2020 and 12/28/2020.

Batch: 490016

Insufficient sample volume was available to perform a sample duplicate for the following samples: JHC-MW-15023 (160-40223-1), JHC-MW-15024 (160-40223-2), JHC-MW-15025 (160-40223-3), JHC-MW-15026 (160-40223-4), JHC-MW-15027 (160-40223-5) and JHC-MW-15028 (160-40223-6). A laboratory control sample/ laboratory control sample duplicate (LCS/LCSD) were prepared instead to demonstrate batch precision.

The Barium recovery is above the 110% QC limit for the QC and client samples. The client requested the samples be reported without a native barium calculation applied. The LCS/LCSD spike recovery is within control limits, which demonstrates acceptable sample preparation and instrument performance. As such, this was an apparent anomaly in the sample preparation. Which did not affect the sample results. The associated samples have been truncated to 100% in order to minimize any potential bias a high carrier recovery may have on the results. JHC-MW-15023 (160-40223-1), JHC-MW-15025 (160-40223-3), JHC-MW-15026 (160-40223-4), JHC-MW-15027 (160-40223-5), JHC-MW-15028 (160-40223-6), (LCS 160-490016/1-A), (LCSD 160-490016/2-A) and (MB 160-490016/23-A)

Batch: 490784

Insufficient sample volume was available to perform a sample duplicate for the following samples: DUP-01 (160-40223-7), EB-01 (160-40223-8) and FB-01 (160-40223-9). A laboratory control sample/ laboratory control sample duplicate (LCS/LCSD) were prepared instead to demonstrate batch precision.

The LCS recovered at (132%) for Ra228. Samples are within the in-house statistical limits of (60-140%). No further action is required. (LCS 160-490784/1-A)

Case Narrative

Client: Consumers Energy
Project/Site: JH Campbell Background Wells

Job ID: 160-40223-1

Job ID: 160-40223-1 (Continued)

Laboratory: Eurofins TestAmerica, St. Louis (Continued)

The following samples have an RER (replicate error ratio) result outside of the acceptance criteria of 1 (1.02) for Ra228. Duplicate precision is demonstrated by acceptable relative percent difference (RPD), within the limit of 40% (25%). The data have been reported with this narrative. (LCSD 160-490784/2-A)

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

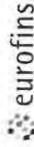
COMBINED RADIUM-226 AND RADIUM-228

Samples JHC-MW-15023 (160-40223-1), JHC-MW-15024 (160-40223-2), JHC-MW-15025 (160-40223-3), JHC-MW-15026 (160-40223-4), JHC-MW-15027 (160-40223-5), JHC-MW-15028 (160-40223-6), DUP-01 (160-40223-7), EB-01 (160-40223-8) and FB-01 (160-40223-9) were analyzed for Combined Radium-226 and Radium-228 in accordance with EPA 903 Radium 226/EPA 904 Radium 228. The samples were analyzed on 01/04/2021, 01/11/2021 and 01/22/2021.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Chain of Custody Record

#3



Environment Testing
TestAmerica

TestAmerica Laboratories, Inc. db/a Eurofins TestAmerica

Regulatory Program: DW NPDES RCRA Other:

Client Contact Consumers Energy, Laboratory Services 135 W. Trail Street Jackson, MI 49201 517-788-5888 (xxx) xxx-xxxx FAX Project Name: JH Campbell Background Wells Project #: 20-1192 P O # 4400094796		Project Manager: Emil Blaj Email: Emil.Blaj@cmsenergy.com Tel/Fax: 517-788-5888		Site Contact: Bethany Swanberg Lab Contact: Emil Blaj		COC No: 1 of 1 COCs Sampler: CLH/DMW/GET For Lab Use Only: Walk-in Client: Lab Sampling: Job / SDG No.:	
Analysis Turnaround Time <input checked="" type="checkbox"/> CALENDAR DAYS <input type="checkbox"/> WORKING DAYS TAT if different from Below _____ <input type="checkbox"/> 2 weeks <input checked="" type="checkbox"/> 1 week <input type="checkbox"/> 2 days <input type="checkbox"/> 1 day		Perform MS / MSD (Y / N) Preservative Radium 226 (EPA 903.1) Radium 228 (EPA 904.0)					
Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Sample Specific Notes:	
JHC-MW-15023	10/20/2020	1603	G	GW	2		
JHC-MW-15024	10/20/20	1452	G	GW	2		
JHC-MW-15025	10/20/20	1355	G	GW	2		
JHC-MW-15026	10/20/20	1251	G	GW	2		
JHC-MW-15027	10/20/20	1200	G	GW	2		
JHC-MW-15028	10/20/20	1038	G	GW	2		
DUP-01	--	--	G	GW	2		
EB-01	10/20/2020	1612	G	DI	2		
FB-01	10/20/2020	1414	G	DI	2		
Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other Possible Hazard Identification: _____ Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample.							
Special Instructions/QC Requirements & Comments: <input checked="" type="checkbox"/> Non-Hazard <input type="checkbox"/> Flammable <input type="checkbox"/> Skin Irritant <input type="checkbox"/> Poison B <input type="checkbox"/> Unknown <input type="checkbox"/> Return to Client <input checked="" type="checkbox"/> Disposal by Lab <input type="checkbox"/> Archive for _____ Months							
Custody Seal No.: _____ Relinquished by: <i>Loni Butcher</i> Relinquished by: <i>WPS</i> Relinquished by: _____		Company: <i>Consumers Energy</i> Company: _____ Company: _____		Date/Time: <i>10/20/2020 10:45</i> Date/Time: _____ Date/Time: _____		Cooler Temp. (°C): Obs'd: _____ Received by: <i>WPS</i> Received in Laboratory by: <i>WPS</i> Date/Time: _____ Date/Time: _____	



160-40223 Chain of Custody

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)



TestAmerica Michigan
10448 Citation Drive; Ste 200
Brighton, MI 48116

PROCUREMENT #: 20101220

QA Code: NQ

(Item 1) - Part Number: N/A - Quantity : 1
JHC CCR Rule GW Q4-2020 Samples

Groundwater Samples for Radium 226 (EPA 903.1) and Radium 228 (EPA 904.0)

Standard TAT Request.

Reference Quote #16009066-0

(Item 2) - Part Number: NA - Quantity : 1

Please include Consumers Energy Project Number and Procurement Number on all submitted invoices

For technical questions, please contact Emil Blaj at 517-788-5888, or Emil.Blaj@cmsenergy.com.

To expedite payment please provide the Procurement number on all invoices.

Send Invoices To:

Consumers Energy Company
Attn: Accounts Payable
135 W Trail St.
Jackson, MI 49201



Login Sample Receipt Checklist

Client: Consumers Energy

Job Number: 160-40223-1

Login Number: 40223

List Source: Eurofins TestAmerica, St. Louis

List Number: 1

Creator: Hoerchler, Elizabeth M

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	N/A	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Definitions/Glossary

Client: Consumers Energy
Project/Site: JH Campbell Background Wells

Job ID: 160-40223-1

Qualifiers

Rad

Qualifier	Qualifier Description
*	LCS or LCSD is outside acceptance limits.
*	RPD of the LCS and LCSD exceeds the control limits
U	Result is less than the sample detection limit.
X	Carrier is outside acceptance limits.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
♠	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

Method Summary

Client: Consumers Energy
Project/Site: JH Campbell Background Wells

Job ID: 160-40223-1

Method	Method Description	Protocol	Laboratory
903.0	Radium-226 (GFPC)	EPA	TAL SL
904.0	Radium-228 (GFPC)	EPA	TAL SL
Ra226_Ra228	Combined Radium-226 and Radium-228	TAL-STL	TAL SL
PrecSep STD	Preparation, Precipitate Separation (Standard In-Growth)	None	TAL SL
PrecSep_0	Preparation, Precipitate Separation	None	TAL SL

Protocol References:

EPA = US Environmental Protection Agency

None = None

TAL-STL = TestAmerica Laboratories, St. Louis, Facility Standard Operating Procedure.

Laboratory References:

TAL SL = Eurofins TestAmerica, St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566

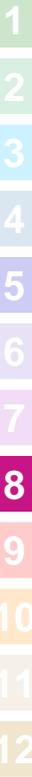


Sample Summary

Client: Consumers Energy
Project/Site: JH Campbell Background Wells

Job ID: 160-40223-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received	Asset ID
160-40223-1	JHC-MW-15023	Water	10/20/20 16:03	11/02/20 11:04	
160-40223-2	JHC-MW-15024	Water	10/20/20 14:52	11/02/20 11:04	
160-40223-3	JHC-MW-15025	Water	10/20/20 13:55	11/02/20 11:04	
160-40223-4	JHC-MW-15026	Water	10/20/20 12:51	11/02/20 11:04	
160-40223-5	JHC-MW-15027	Water	10/20/20 12:00	11/02/20 11:04	
160-40223-6	JHC-MW-15028	Water	10/20/20 10:38	11/02/20 11:04	
160-40223-7	DUP-01	Water	10/20/20 00:00	11/02/20 11:04	
160-40223-8	EB-01	Water	10/20/20 16:12	11/02/20 11:04	
160-40223-9	FB-01	Water	10/20/20 14:14	11/02/20 11:04	



Client Sample Results

Client: Consumers Energy
Project/Site: JH Campbell Background Wells

Job ID: 160-40223-1

Client Sample ID: JHC-MW-15023

Lab Sample ID: 160-40223-1

Date Collected: 10/20/20 16:03

Matrix: Water

Date Received: 11/02/20 11:04

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.0774	U *	0.146	0.146	1.00	0.262	pCi/L	11/24/20 07:52	12/23/20 09:59	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	146	X	40 - 110					11/24/20 07:52	12/23/20 09:59	1

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.0481	U	0.105	0.105	1.00	0.182	pCi/L	11/24/20 08:31	12/22/20 08:38	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	146	X	40 - 110					11/24/20 08:31	12/22/20 08:38	1
Y Carrier	95.3		40 - 110					11/24/20 08:31	12/22/20 08:38	1

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.126	U	0.180	0.180	5.00	0.262	pCi/L		01/11/21 21:18	1

Client Sample ID: JHC-MW-15024

Lab Sample ID: 160-40223-2

Date Collected: 10/20/20 14:52

Matrix: Water

Date Received: 11/02/20 11:04

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	-0.0300	U *	0.134	0.134	1.00	0.294	pCi/L	11/24/20 07:52	12/23/20 09:59	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	124	X	40 - 110					11/24/20 07:52	12/23/20 09:59	1

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	-0.199	U	0.309	0.310	1.00	0.582	pCi/L	01/18/21 08:52	01/21/21 08:54	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	86.9		40 - 110					01/18/21 08:52	01/21/21 08:54	1
Y Carrier	95.7		40 - 110					01/18/21 08:52	01/21/21 08:54	1

Client Sample Results

Client: Consumers Energy
Project/Site: JH Campbell Background Wells

Job ID: 160-40223-1

Client Sample ID: JHC-MW-15024

Lab Sample ID: 160-40223-2

Date Collected: 10/20/20 14:52

Matrix: Water

Date Received: 11/02/20 11:04

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	-0.229	U	0.337	0.338	5.00	0.582	pCi/L		01/22/21 21:47	1

Client Sample ID: JHC-MW-15025

Lab Sample ID: 160-40223-3

Date Collected: 10/20/20 13:55

Matrix: Water

Date Received: 11/02/20 11:04

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.0294	U *	0.140	0.140	1.00	0.269	pCi/L	11/24/20 07:52	12/23/20 09:59	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	182	X	40 - 110					11/24/20 07:52	12/23/20 09:59	1

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.114	U	0.128	0.128	1.00	0.209	pCi/L	11/24/20 08:31	12/22/20 08:30	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	182	X	40 - 110					11/24/20 08:31	12/22/20 08:30	1
Y Carrier	80.4		40 - 110					11/24/20 08:31	12/22/20 08:30	1

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.144	U	0.190	0.190	5.00	0.269	pCi/L		01/11/21 21:18	1

Client Sample ID: JHC-MW-15026

Lab Sample ID: 160-40223-4

Date Collected: 10/20/20 12:51

Matrix: Water

Date Received: 11/02/20 11:04

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.0589	U *	0.143	0.143	1.00	0.264	pCi/L	11/24/20 07:52	12/23/20 09:59	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	154	X	40 - 110					11/24/20 07:52	12/23/20 09:59	1

Client Sample Results

Client: Consumers Energy
Project/Site: JH Campbell Background Wells

Job ID: 160-40223-1

Client Sample ID: JHC-MW-15026

Lab Sample ID: 160-40223-4

Date Collected: 10/20/20 12:51

Matrix: Water

Date Received: 11/02/20 11:04

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.107	U	0.213	0.213	1.00	0.364	pCi/L	11/24/20 08:31	12/22/20 08:30	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	154	X	40 - 110					11/24/20 08:31	12/22/20 08:30	1
Y Carrier	53.1		40 - 110					11/24/20 08:31	12/22/20 08:30	1

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.166	U	0.257	0.257	5.00	0.364	pCi/L		01/11/21 21:18	1

Client Sample ID: JHC-MW-15027

Lab Sample ID: 160-40223-5

Date Collected: 10/20/20 12:00

Matrix: Water

Date Received: 11/02/20 11:04

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.123	U *	0.210	0.210	1.00	0.368	pCi/L	11/24/20 07:52	12/23/20 09:59	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	93.9		40 - 110					11/24/20 07:52	12/23/20 09:59	1

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	-0.00875	U	0.229	0.229	1.00	0.411	pCi/L	11/24/20 08:31	12/22/20 08:30	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	93.9		40 - 110					11/24/20 08:31	12/22/20 08:30	1
Y Carrier	82.6		40 - 110					11/24/20 08:31	12/22/20 08:30	1

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.114	U	0.311	0.311	5.00	0.411	pCi/L		01/11/21 21:18	1

Client Sample Results

Client: Consumers Energy
Project/Site: JH Campbell Background Wells

Job ID: 160-40223-1

Client Sample ID: JHC-MW-15028

Lab Sample ID: 160-40223-6

Date Collected: 10/20/20 10:38

Matrix: Water

Date Received: 11/02/20 11:04

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.0578	U *	0.140	0.140	1.00	0.258	pCi/L	11/24/20 07:52	12/23/20 12:08	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	140	X	40 - 110					11/24/20 07:52	12/23/20 12:08	1

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.346		0.166	0.169	1.00	0.240	pCi/L	11/24/20 08:31	12/22/20 08:30	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	140	X	40 - 110					11/24/20 08:31	12/22/20 08:30	1
Y Carrier	85.6		40 - 110					11/24/20 08:31	12/22/20 08:30	1

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.403		0.217	0.219	5.00	0.258	pCi/L		01/11/21 21:18	1

Client Sample ID: DUP-01

Lab Sample ID: 160-40223-7

Date Collected: 10/20/20 00:00

Matrix: Water

Date Received: 11/02/20 11:04

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.0810	U	0.171	0.171	1.00	0.313	pCi/L	12/03/20 08:22	12/28/20 13:17	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	83.1		40 - 110					12/03/20 08:22	12/28/20 13:17	1

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.221	U *	0.247	0.248	1.00	0.406	pCi/L	12/03/20 08:51	12/28/20 08:25	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	83.1		40 - 110					12/03/20 08:51	12/28/20 08:25	1
Y Carrier	103		40 - 110					12/03/20 08:51	12/28/20 08:25	1

Client Sample Results

Client: Consumers Energy
Project/Site: JH Campbell Background Wells

Job ID: 160-40223-1

Client Sample ID: DUP-01

Lab Sample ID: 160-40223-7

Date Collected: 10/20/20 00:00

Matrix: Water

Date Received: 11/02/20 11:04

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.302	U	0.300	0.301	5.00	0.406	pCi/L		01/04/21 20:59	1

Client Sample ID: EB-01

Lab Sample ID: 160-40223-8

Date Collected: 10/20/20 16:12

Matrix: Water

Date Received: 11/02/20 11:04

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.128	U	0.229	0.229	1.00	0.402	pCi/L	12/03/20 08:22	12/28/20 13:17	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	81.7		40 - 110					12/03/20 08:22	12/28/20 13:17	1

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.000	U *	0.248	0.248	1.00	0.443	pCi/L	12/03/20 08:51	12/28/20 08:25	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	81.7		40 - 110					12/03/20 08:51	12/28/20 08:25	1
Y Carrier	87.5		40 - 110					12/03/20 08:51	12/28/20 08:25	1

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.128	U	0.338	0.338	5.00	0.443	pCi/L		01/04/21 20:59	1

Client Sample ID: FB-01

Lab Sample ID: 160-40223-9

Date Collected: 10/20/20 14:14

Matrix: Water

Date Received: 11/02/20 11:04

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.0751	U	0.209	0.209	1.00	0.389	pCi/L	12/03/20 08:22	12/28/20 13:17	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	73.9		40 - 110					12/03/20 08:22	12/28/20 13:17	1

Client Sample Results

Client: Consumers Energy
 Project/Site: JH Campbell Background Wells

Job ID: 160-40223-1

Client Sample ID: FB-01

Lab Sample ID: 160-40223-9

Date Collected: 10/20/20 14:14

Matrix: Water

Date Received: 11/02/20 11:04

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.225	U *	0.320	0.320	1.00	0.535	pCi/L	12/03/20 08:51	12/28/20 08:25	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	73.9		40 - 110					12/03/20 08:51	12/28/20 08:25	1
Y Carrier	81.1		40 - 110					12/03/20 08:51	12/28/20 08:25	1

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.300	U	0.382	0.382	5.00	0.535	pCi/L		01/04/21 20:59	1

QC Sample Results

Client: Consumers Energy
Project/Site: JH Campbell Background Wells

Job ID: 160-40223-1

Method: 903.0 - Radium-226 (GFPC)

Lab Sample ID: MB 160-490013/23-A
Matrix: Water
Analysis Batch: 492889

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 490013

Analyte	MB MB		Count	Total	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
	Result	Qualifier	Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Radium-226	-0.08283	U	0.124	0.124	1.00	0.300	pCi/L	11/24/20 07:52	12/23/20 12:08	1
Carrier	MB MB		Limits			Prepared	Analyzed	Dil Fac		
	%Yield	Qualifier								
Ba Carrier	137	X	40 - 110			11/24/20 07:52	12/23/20 12:08	1		

Lab Sample ID: LCS 160-490013/1-A
Matrix: Water
Analysis Batch: 492889

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 490013

Analyte	Spike Added	LCS Result	LCS Qual	Total	RL	MDC	Unit	%Rec	%Rec. Limits
				Uncert. (2σ+/-)					
Radium-226	11.3	15.03	*	1.87	1.00	0.379	pCi/L	132	75 - 125
Carrier	LCS %Yield	LCS Qualifier	Limits						
Ba Carrier	78.2		40 - 110						

Lab Sample ID: LCSD 160-490013/2-A
Matrix: Water
Analysis Batch: 492889

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 490013

Analyte	Spike Added	LCSD Result	LCSD Qual	Total	RL	MDC	Unit	%Rec	%Rec. Limits	RER	Limit
				Uncert. (2σ+/-)							
Radium-226	11.3	12.75		1.59	1.00	0.360	pCi/L	112	75 - 125	0.66	1
Carrier	LCSD %Yield	LCSD Qualifier	Limits								
Ba Carrier	104		40 - 110								

Lab Sample ID: MB 160-490781/23-A
Matrix: Water
Analysis Batch: 493176

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 490781

Analyte	MB MB		Count	Total	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
	Result	Qualifier	Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Radium-226	0.09532	U	0.175	0.176	1.00	0.311	pCi/L	12/03/20 08:22	12/28/20 19:04	1
Carrier	MB MB		Limits			Prepared	Analyzed	Dil Fac		
	%Yield	Qualifier								
Ba Carrier	83.1		40 - 110			12/03/20 08:22	12/28/20 19:04	1		

Lab Sample ID: LCS 160-490781/1-A
Matrix: Water
Analysis Batch: 493176

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 490781

Analyte	Spike Added	LCS Result	LCS Qual	Total	RL	MDC	Unit	%Rec	%Rec. Limits
				Uncert. (2σ+/-)					
Radium-226	11.3	10.04		1.34	1.00	0.326	pCi/L	89	75 - 125

QC Sample Results

Client: Consumers Energy
Project/Site: JH Campbell Background Wells

Job ID: 160-40223-1

Method: 903.0 - Radium-226 (GFPC) (Continued)

Lab Sample ID: LCS 160-490781/1-A
Matrix: Water
Analysis Batch: 493176

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 490781

Carrier	LCS %Yield	LCS Qualifier	Limits
Ba Carrier	83.7		40 - 110

Lab Sample ID: LCSD 160-490781/2-A
Matrix: Water
Analysis Batch: 493176

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 490781

Analyte	Spike Added	LCSD Result	LCSD Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits	RER	RER Limit
Radium-226	11.3	10.46		1.41	1.00	0.394	pCi/L	92	75 - 125	0.15	1

Carrier	LCSD %Yield	LCSD Qualifier	Limits
Ba Carrier	76.8		40 - 110

Method: 904.0 - Radium-228 (GFPC)

Lab Sample ID: MB 160-490016/23-A
Matrix: Water
Analysis Batch: 492806

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 490016

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.2258	U	0.171	0.172	1.00	0.269	pCi/L	11/24/20 08:31	12/22/20 08:31	1

Carrier	MB %Yield	MB Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	137	X	40 - 110	11/24/20 08:31	12/22/20 08:31	1
Y Carrier	80.0		40 - 110	11/24/20 08:31	12/22/20 08:31	1

Lab Sample ID: LCS 160-490016/1-A
Matrix: Water
Analysis Batch: 492800

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 490016

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits
Radium-228	7.56	7.794		0.991	1.00	0.484	pCi/L	103	75 - 125

Carrier	LCS %Yield	LCS Qualifier	Limits
Ba Carrier	78.2		40 - 110
Y Carrier	85.2		40 - 110

Lab Sample ID: LCSD 160-490016/2-A
Matrix: Water
Analysis Batch: 492800

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 490016

Analyte	Spike Added	LCSD Result	LCSD Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits	RER	RER Limit
Radium-228	7.56	6.773		0.837	1.00	0.373	pCi/L	90	75 - 125	0.56	1

Eurofins TestAmerica, St. Louis

QC Sample Results

Client: Consumers Energy
Project/Site: JH Campbell Background Wells

Job ID: 160-40223-1

Method: 904.0 - Radium-228 (GFPC) (Continued)

Lab Sample ID: LCSD 160-490016/2-A
Matrix: Water
Analysis Batch: 492800

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 490016

	<i>LCS</i>	<i>LCS</i>	
<i>Carrier</i>	<i>%Yield</i>	<i>Qualifier</i>	<i>Limits</i>
Ba Carrier	104		40 - 110
Y Carrier	82.6		40 - 110

Lab Sample ID: MB 160-490784/23-A
Matrix: Water
Analysis Batch: 493206

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 490784

Analyte	MB MB		Count	Total	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
	Result	Qualifier	Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Radium-228	0.5069		0.262	0.266	1.00	0.384	pCi/L	12/03/20 08:51	12/28/20 08:29	1

	<i>MB</i>	<i>MB</i>		<i>Prepared</i>	<i>Analyzed</i>	<i>Dil Fac</i>
<i>Carrier</i>	<i>%Yield</i>	<i>Qualifier</i>	<i>Limits</i>			
Ba Carrier	83.1		40 - 110	12/03/20 08:51	12/28/20 08:29	1
Y Carrier	90.8		40 - 110	12/03/20 08:51	12/28/20 08:29	1

Lab Sample ID: LCS 160-490784/1-A
Matrix: Water
Analysis Batch: 493174

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 490784

Analyte	Spike Added	LCS Result	LCS Qual	Total	RL	MDC	Unit	%Rec	%Rec. Limits
				Uncert. (2σ+/-)					
Radium-228	7.55	9.968	*	1.19	1.00	0.487	pCi/L	132	75 - 125

	<i>LCS</i>	<i>LCS</i>	
<i>Carrier</i>	<i>%Yield</i>	<i>Qualifier</i>	<i>Limits</i>
Ba Carrier	83.7		40 - 110
Y Carrier	78.9		40 - 110

Lab Sample ID: LCSD 160-490784/2-A
Matrix: Water
Analysis Batch: 493174

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 490784

Analyte	Spike Added	LCSD Result	LCSD Qual	Total	RL	MDC	Unit	%Rec	%Rec. Limits	RER	RER Limit
				Uncert. (2σ+/-)							
Radium-228	7.55	7.788	*	0.935	1.00	0.381	pCi/L	103	75 - 125	1.02	1

	<i>LCSD</i>	<i>LCSD</i>	
<i>Carrier</i>	<i>%Yield</i>	<i>Qualifier</i>	<i>Limits</i>
Ba Carrier	76.8		40 - 110
Y Carrier	110		40 - 110

Lab Sample ID: MB 160-495466/14-A
Matrix: Water
Analysis Batch: 496078

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 495466

Analyte	MB MB		Count	Total	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
	Result	Qualifier	Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Radium-228	0.1706	U	0.283	0.284	1.00	0.481	pCi/L	01/18/21 08:52	01/21/21 08:54	1

QC Sample Results

Client: Consumers Energy
Project/Site: JH Campbell Background Wells

Job ID: 160-40223-1

Method: 904.0 - Radium-228 (GFPC) (Continued)

Lab Sample ID: MB 160-495466/14-A
Matrix: Water
Analysis Batch: 496078

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 495466

Carrier	MB MB		Limits
	%Yield	Qualifier	
Ba Carrier	83.8		40 - 110
Y Carrier	95.0		40 - 110

Prepared	Analyzed	Dil Fac
01/18/21 08:52	01/21/21 08:54	1
01/18/21 08:52	01/21/21 08:54	1

Lab Sample ID: LCS 160-495466/1-A
Matrix: Water
Analysis Batch: 496073

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 495466

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits	
Radium-228	9.98	9.708		1.24	1.00	0.612	pCi/L	97	75 - 125	

Carrier	LCS LCS		Limits
	%Yield	Qualifier	
Ba Carrier	82.6		40 - 110
Y Carrier	89.7		40 - 110

Lab Sample ID: 500-192070-E-8-B DU
Matrix: Water
Analysis Batch: 496073

Client Sample ID: Duplicate
Prep Type: Total/NA
Prep Batch: 495466

Analyte	Sample Sample		DU Result	DU Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	RER	RER Limit
	Result	Qual								
Radium-228	0.146	U	0.2712	U	0.342	1.00	0.565	pCi/L	0.20	1

Carrier	DU DU		Limits
	%Yield	Qualifier	
Ba Carrier	87.2		40 - 110
Y Carrier	92.7		40 - 110

QC Association Summary

Client: Consumers Energy
Project/Site: JH Campbell Background Wells

Job ID: 160-40223-1

Rad

Prep Batch: 490013

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-40223-1	JHC-MW-15023	Total/NA	Water	PrecSep STD	
160-40223-2	JHC-MW-15024	Total/NA	Water	PrecSep STD	
160-40223-3	JHC-MW-15025	Total/NA	Water	PrecSep STD	
160-40223-4	JHC-MW-15026	Total/NA	Water	PrecSep STD	
160-40223-5	JHC-MW-15027	Total/NA	Water	PrecSep STD	
160-40223-6	JHC-MW-15028	Total/NA	Water	PrecSep STD	
MB 160-490013/23-A	Method Blank	Total/NA	Water	PrecSep STD	
LCS 160-490013/1-A	Lab Control Sample	Total/NA	Water	PrecSep STD	
LCSD 160-490013/2-A	Lab Control Sample Dup	Total/NA	Water	PrecSep STD	

Prep Batch: 490016

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-40223-1	JHC-MW-15023	Total/NA	Water	PrecSep_0	
160-40223-3	JHC-MW-15025	Total/NA	Water	PrecSep_0	
160-40223-4	JHC-MW-15026	Total/NA	Water	PrecSep_0	
160-40223-5	JHC-MW-15027	Total/NA	Water	PrecSep_0	
160-40223-6	JHC-MW-15028	Total/NA	Water	PrecSep_0	
MB 160-490016/23-A	Method Blank	Total/NA	Water	PrecSep_0	
LCS 160-490016/1-A	Lab Control Sample	Total/NA	Water	PrecSep_0	
LCSD 160-490016/2-A	Lab Control Sample Dup	Total/NA	Water	PrecSep_0	

Prep Batch: 490781

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-40223-7	DUP-01	Total/NA	Water	PrecSep STD	
160-40223-8	EB-01	Total/NA	Water	PrecSep STD	
160-40223-9	FB-01	Total/NA	Water	PrecSep STD	
MB 160-490781/23-A	Method Blank	Total/NA	Water	PrecSep STD	
LCS 160-490781/1-A	Lab Control Sample	Total/NA	Water	PrecSep STD	
LCSD 160-490781/2-A	Lab Control Sample Dup	Total/NA	Water	PrecSep STD	

Prep Batch: 490784

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-40223-7	DUP-01	Total/NA	Water	PrecSep_0	
160-40223-8	EB-01	Total/NA	Water	PrecSep_0	
160-40223-9	FB-01	Total/NA	Water	PrecSep_0	
MB 160-490784/23-A	Method Blank	Total/NA	Water	PrecSep_0	
LCS 160-490784/1-A	Lab Control Sample	Total/NA	Water	PrecSep_0	
LCSD 160-490784/2-A	Lab Control Sample Dup	Total/NA	Water	PrecSep_0	

Prep Batch: 495466

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-40223-2	JHC-MW-15024	Total/NA	Water	PrecSep_0	
MB 160-495466/14-A	Method Blank	Total/NA	Water	PrecSep_0	
LCS 160-495466/1-A	Lab Control Sample	Total/NA	Water	PrecSep_0	
500-192070-E-8-B DU	Duplicate	Total/NA	Water	PrecSep_0	

Tracer/Carrier Summary

Client: Consumers Energy
 Project/Site: JH Campbell Background Wells

Job ID: 160-40223-1

Method: 903.0 - Radium-226 (GFPC)

Matrix: Water

Prep Type: Total/NA

Lab Sample ID	Client Sample ID	Percent Yield (Acceptance Limits)	
		Ba (40-110)	
160-40223-1	JHC-MW-15023	146 X	
160-40223-2	JHC-MW-15024	124 X	
160-40223-3	JHC-MW-15025	182 X	
160-40223-4	JHC-MW-15026	154 X	
160-40223-5	JHC-MW-15027	93.9	
160-40223-6	JHC-MW-15028	140 X	
160-40223-7	DUP-01	83.1	
160-40223-8	EB-01	81.7	
160-40223-9	FB-01	73.9	
LCS 160-490013/1-A	Lab Control Sample	78.2	
LCS 160-490781/1-A	Lab Control Sample	83.7	
LCSD 160-490013/2-A	Lab Control Sample Dup	104	
LCSD 160-490781/2-A	Lab Control Sample Dup	76.8	
MB 160-490013/23-A	Method Blank	137 X	
MB 160-490781/23-A	Method Blank	83.1	

Tracer/Carrier Legend

Ba = Ba Carrier

Method: 904.0 - Radium-228 (GFPC)

Matrix: Water

Prep Type: Total/NA

Lab Sample ID	Client Sample ID	Percent Yield (Acceptance Limits)	
		Ba (40-110)	Y (40-110)
160-40223-1	JHC-MW-15023	146 X	95.3
160-40223-2	JHC-MW-15024	86.9	95.7
160-40223-3	JHC-MW-15025	182 X	80.4
160-40223-4	JHC-MW-15026	154 X	53.1
160-40223-5	JHC-MW-15027	93.9	82.6
160-40223-6	JHC-MW-15028	140 X	85.6
160-40223-7	DUP-01	83.1	103
160-40223-8	EB-01	81.7	87.5
160-40223-9	FB-01	73.9	81.1
500-192070-E-8-B DU	Duplicate	87.2	92.7
LCS 160-490016/1-A	Lab Control Sample	78.2	85.2
LCS 160-490784/1-A	Lab Control Sample	83.7	78.9
LCS 160-495466/1-A	Lab Control Sample	82.6	89.7
LCSD 160-490016/2-A	Lab Control Sample Dup	104	82.6
LCSD 160-490784/2-A	Lab Control Sample Dup	76.8	110
MB 160-490016/23-A	Method Blank	137 X	80.0
MB 160-490784/23-A	Method Blank	83.1	90.8
MB 160-495466/14-A	Method Blank	83.8	95.0

Tracer/Carrier Legend

Ba = Ba Carrier

Y = Y Carrier

Appendix E

October 2020 Field Notes

Consumers Energy Company
Monitoring Well Sampling Worksheet

Well ID JHC MW15023 Date 10.20.20 Control Number 20-1192-01
 Location JH Campbell Depth-to-Screen Bottom (ft) _____ Casing ID (in) _____
 Depth-to-Midscreen (ft) _____ Screen Length (ft) _____ Protective Casing Mount (y/n) _____

Field Measurements

Depth-to-water (ft) 17.71 HC Layer Detected (Y/N) N Completed by dmw

Time	pH	Temp	Sp Cond	DO	DO	ORP	Pump Rate	Water level	Turbidity
min	units	°C	uS/cm	% sat.	ppm	mV	mL/min	Drawdown ft	NTU
3-5 min	+/- 0.1	NA	+/- 3%	+/- 10%	+/- 10%	+/- 10mV	*	< 0.33	+/- 10%
1536								17.71	
1537	6.82	12.0	60.2	21.0	2.22	+163.7	200	17.71	19.74
1542	5.54	12.1	69.0	6.5	0.69	+224.3	200	17.71	9.42
1547	5.52	12.1	71.3	6.2	0.66	+224.7	200	17.71	8.97
1552	5.51	12.3	74.4	5.8	0.62	+224.1	200	17.71	9.29
1557	5.51	12.0	74.1	5.8	0.61	+225.2	200	17.71	9.43
1602	5.51	12.1	74.3	5.8	0.62	+225.8	200	17.71	9.36
1603									

Total Pump Time (min) 27 Total Purge Volume (gal) 1.4 Reviewed by [Signature] 11-04-20

Comments:

Bottles Filled		Preservative Codes			A - NONE B - HNO3 C - H2SO4 D - NaOH E - HCl F - _____				
Number	Size	Type	Preservative Code	Filtered Y/N	Number	Size	Type	Preservative Code	Filtered Y/N
1	125ml	HDP6	A	N					
1	↓	↓	B	↓					
1	250ml	↓	A	↓					
2	1L	↓	B	↓					

* Pump rate should be <500 mL/min for low-flow and <1 gal/min for high Volume.

Consumers Energy Company
Monitoring Well Sampling Worksheet

Well ID JHC MW-15024 Date 10.20.20 Control Number 20-1192-02
 Location JH Campbell Depth-to-Screen Bottom (ft) _____ Casing ID (in) _____
 Depth-to-Midscreen (ft) _____ Screen Length (ft) _____ Protective Casing Mount (y/n) _____

Field Measurements

Sonde ID: 19M

Depth-to-water (ft) 12.50 HC Layer Detected (Y/N) N Completed by dmw

Time	pH	Temp	Sp Cond	DO	DO	ORP	Pump Rate	Water level	Turbidity
min	units	°C	uS/cm	% sat.	ppm	mV	mL/min	ft	NTU
3-5 min	+/- 0.1	NA	+/- 3%	+/- 10%	+/- 10%	+/- 10mV	*	< 0.33	+/- 10%
1424									
1426	6.75	11.9	353.0	21.0	2.15	+144.7	200	12.50	48.70
1431	7.14	11.9	347.1	5.7	0.61	+132.6	200	12.50	28.03
1436	7.28	12.0	330.9	3.2	0.35	+124.6	200	12.50	12.14
1441	7.06	11.9	317.9	2.8	0.30	+124.6	200	12.50	8.88
1446	6.97	11.9	312.1	2.7	0.28	+120.1	200	12.50	9.01
1451	6.94	11.9	308.3	2.7	0.28	+116.1	200	12.50	9.14
1452									

Total Pump Time (min) 28 Total Purge Volume (gal) 1.5 Reviewed by [Signature]

Weather: _____

Comments: _____

Bottles Filled		Preservative Codes		A - NONE B - HNO3 C - H2SO4 D - NaOH E - HCl F - _____					
Number	Size	Type	Preservative Code	Filtered Y/N	Number	Size	Type	Preservative Code	Filtered Y/N
1	125ml	ADP6	A						
1	↓	↓	B						
1	250ml	↓	A						
2	1L	↓	B						

* Pump rate should be <500 mL/min for low-flow and <1 gal/min for high Volume.

Consumers Energy Company
 Monitoring Well Sampling Worksheet

Well ID JHC MW-15025 Date 10.20.20 Control Number 20-1192-03
 Location JH Campbell Well Material: PVC SS Iron Galv. Steel
 Purge Method: Peristaltic Submersible Fultz Bailer
 Depth to Water Tape: _____ S/N: _____

QC SAMPLE: MS/MSD DUP- Sonde ID: 08C 11M 15H 19M

Depth-to-water T/PVC (ft) 11.44 Depth-To-Bottom T/PVC (ft) _____ Completed by dmw

Time	pH	Temp	Sp Cond	DO	DO	ORP	Pump Rate	Water level	Turbidity
min	units	°C	uS/cm	% sat.	ppm	mV	mL/min	Drawdown ft	NTU
3-5 min	+/- 0.1	NA	+/- 3%	+/- 10%	+/- 10%	+/- 10mV	*	< 0.33	+/- 10%

Stabilization parameters for the last three readings

1313								11.44	
1314	6.71	12.1	380.8	37.8	3.95	+146.6	200	11.44	11.60
1319	7.37	12.1	395.5	7.2	0.76	+127.9	200	11.44	9.27
1324	7.49	12.0	392.4	6.5	0.69	+122.5	200	11.44	9.50
1329	7.14	12.0	327.1	8.1	0.86	+121.4	200	11.44	9.11
1334	6.78	12.2	272.2	10.3	1.10	+127.1	200	11.44	8.97
1339	6.74	12.2	269.1	10.7	1.13	+128.2	2.800	11.44	8.94
1344	6.68	12.1	261.3	12.6	1.34	+132.0	2.000	11.44	9.05
1349	6.56	12.1	257.6	13.4	1.43	+135.5	2.100	11.44	9.16
1354	6.55	12.0	262.3	13.3	1.42	+136.7	200	11.44	9.23
1355									

Total Pump Time (min): 42 Total Purge Volume (gal) : 2.2 Reviewed by: [Signature]

Weather: Cloudy; 50°F 11-04-20

Comments:

Bottles Filled		Preservative Codes: A - NONE B - HNO3 C - H2SO4 D - NaOH E - HCl F - _____							
Quantity	Size	Type	Preservative Code	Filtered Y/N	Quantity	Size	Type	Preservative Code	Filtered Y/N
3	125ml	HDPB	A	N					
3	↓	↓	B	↓					
3	250ml	↓	A	↓					
2	1L	↓	B	↓					

* Pump rate should be <500 mL/min for low-flow and <1 gal/min for high Volume.

**Consumers Energy Company
Monitoring Well Sampling Worksheet**

Well ID JHC MW 15026 Date 10.20.20 Control Number 20-1192-04
 Location JH Campbell Depth-to-Screen Bottom (ft) _____ Casing ID (in) _____
 Depth-to-Midscreen (ft) _____ Screen Length (ft) _____ Protective Casing Mount (y/n) _____

Field Measurements

Sonde ID: 19M

Depth-to-water (ft) 12.91 HC Layer Detected (Y/N) N Completed by dmw

Time	pH	Temp	Sp Cond	DO	DO	ORP	Pump Rate	Water level	Turbidity
min	units	°C	uS/cm	% sat.	ppm	mV	mL/min	Drawdown ft	NTU
3-5 min	+/- 0.1	NA	+/- 3%	+/- 10%	+/- 10%	+/- 10mV	*	< 0.33	+/- 10%
<u>1224</u>								<u>12.93</u>	
<u>1225</u>	<u>6.50</u>	<u>11.3</u>	<u>247.3</u>	<u>48.9</u>	<u>5.27</u>	<u>+119.1</u>	<u>200</u>	<u>12.93</u>	<u>9.75</u>
<u>1230</u>	<u>6.79</u>	<u>11.3</u>	<u>190.0</u>	<u>41.3</u>	<u>4.48</u>	<u>+109.5</u>	<u>200</u>	<u>12.93</u>	<u>8.03</u>
<u>1235</u>	<u>6.56</u>	<u>11.3</u>	<u>133.5</u>	<u>36.4</u>	<u>3.95</u>	<u>+125.2</u>	<u>200</u>	<u>12.93</u>	<u>8.40</u>
<u>1240</u>	<u>6.45</u>	<u>11.5</u>	<u>128.3</u>	<u>35.2</u>	<u>3.81</u>	<u>+133.4</u>	<u>200</u>	<u>12.93</u>	<u>8.61</u>
<u>1245</u>	<u>6.44</u>	<u>11.4</u>	<u>128.1</u>	<u>35.0</u>	<u>3.79</u>	<u>+135.2</u>	<u>200</u>	<u>12.93</u>	<u>8.77</u>
<u>1250</u>	<u>6.42</u>	<u>11.5</u>	<u>126.8</u>	<u>34.8</u>	<u>3.77</u>	<u>+138.1</u>	<u>200</u>	<u>12.93</u>	<u>8.60</u>
<u>1251 +255</u>									
<u>dmw</u>									
<u>10.20.20</u>									

Total Pump Time (min) 27 Total Purge Volume (gal) 1.4 Reviewed by [Signature]

Weather: cloudy, 46°F 11-oct-20

Comments: _____

Bottles Filled		Preservative Codes			A - NONE	B - HNO3	C - H2SO4	D - NaOH	E - HCl	F - _____
Number	Size	Type	Preservative Code	Filtered Y/N	Number	Size	Type	Preservative Code	Filtered Y/N	
<u>1</u>	<u>125ml</u>	<u>HDRG</u>	<u>A</u>	<u>N</u>						
<u>1</u>	<u>↓</u>	<u>↓</u>	<u>B</u>	<u>↓</u>						
<u>1</u>	<u>250ml</u>	<u>↓</u>	<u>A</u>	<u>↓</u>						
<u>2</u>	<u>1L</u>	<u>↓</u>	<u>B</u>	<u>↓</u>						

* Pump rate should be <500 mL/min for low-flow and <1 gal/min for high Volume.

**Consumers Energy Company
Monitoring Well Sampling Worksheet**

Well ID JHC MW-15027 Date 10-20-20 Control Number 20-1192-05
 Location JHC Campbell Depth-to-Screen Bottom (ft) _____ Casing ID (in) _____
 Depth-to-Midscreen (ft) _____ Screen Length (ft) _____ Protective Casing Mount (y/n) _____

Field Measurements

Sonde ID: 19M

Depth-to-water (ft) 13.13 HC Layer Detected (Y/N) N Completed by dmw

Time	pH	Temp	Sp Cond	DO	DO	ORP	Pump Rate	Water level	Turbidity
min	units	°C	uS/cm	% sat.	ppm	mV	mL/min	Drawdown ft	NTU
3-5 min	+/- 0.1	NA	+/- 3%	+/- 10%	+/- 10%	+/- 10mV	*	< 0.33	+/- 10%
<u>1118</u>								<u>13.16</u>	
<u>1119</u>	<u>7.07</u>	<u>11.1</u>	<u>40.0</u>	<u>33.7</u>	<u>3.62</u>	<u>+122.1</u>	<u>200</u>	<u>13.16</u>	<u>60.11</u>
<u>1124</u>	<u>6.21</u>	<u>10.7</u>	<u>30.9</u>	<u>11.5</u>	<u>1.26</u>	<u>+150.5</u>	<u>200</u>	<u>13.16</u>	<u>47.38</u>
<u>1129</u>	<u>5.85</u>	<u>10.7</u>	<u>48.0</u>	<u>11.4</u>	<u>1.25</u>	<u>+128.4</u>	<u>200</u>	<u>13.16</u>	<u>19.44</u>
<u>1134</u>	<u>5.86</u>	<u>10.7</u>	<u>63.5</u>	<u>12.3</u>	<u>1.35</u>	<u>+117.6</u>	<u>200</u>	<u>13.16</u>	<u>11.71</u>
<u>1139</u>	<u>5.89</u>	<u>10.8</u>	<u>71.2</u>	<u>14.7</u>	<u>1.62</u>	<u>+115.8</u>	<u>200</u>	<u>13.16</u>	<u>5.11</u>
<u>1144</u>	<u>5.91</u>	<u>10.9</u>	<u>74.1</u>	<u>15.2</u>	<u>1.73</u>	<u>+111.6</u>	<u>200</u>	<u>13.16</u>	<u>5.64</u>
<u>1149</u>	<u>5.93</u>	<u>10.9</u>	<u>78.2</u>	<u>16.4</u>	<u>1.81</u>	<u>+102.8</u>	<u>200</u>	<u>13.16</u>	<u>5.71</u>
<u>1154</u>	<u>5.95</u>	<u>10.9</u>	<u>79.6</u>	<u>16.6</u>	<u>1.84</u>	<u>+98.4</u>	<u>200</u>	<u>13.16</u>	<u>5.66</u>
<u>1159</u>	<u>6.01</u>	<u>11.0</u>	<u>80.7</u>	<u>17.1</u>	<u>1.87</u>	<u>+94.3</u>	<u>200</u>	<u>13.16</u>	<u>5.74</u>
<u>1200</u>									

Total Pump Time (min) 42 Total Purge Volume (gal) 2.2 Reviewed by [Signature]

Weather: Cloudy; 44°F 11-04-20

Comments: _____

Bottles Filled		Preservative Codes			A - NONE B - HNO3 C - H2SO4 D - NaOH E - HCl F - _____				
Number	Size	Type	Preservative Code	Filtered Y/N	Number	Size	Type	Preservative Code	Filtered Y/N
<u>2</u>	<u>125ml</u>	<u>HOPK</u>	<u>A, B</u>	<u>N</u>					
<u>1</u>	<u>250ml</u>	<u>↓</u>	<u>A</u>	<u>N</u>					
<u>2</u>	<u>1L</u>	<u>↓</u>	<u>B</u>	<u>N</u>					

* Pump rate should be <500 mL/min for low-flow and <1 gal/min for high Volume.

Consumers Energy Company
 Monitoring Well Sampling Worksheet

Well ID JHC MW-15028 Date 10.20.20 Control Number 20-1192-06
 Location JH Campbell Well Material: PVC SS Iron Galv. Steel
 Purge Method: Peristaltic Submersible Fultz Bailer
 Depth to Water Tape: _____ S/N: _____

QC SAMPLE: MS/MSD DUP- 01 Sonde ID: 08C 11M 15H 19M

Depth-to-water T/PVC (ft) 12.77 Depth-To-Bottom T/PVC (ft) _____ Completed by dmw

Time	pH	Temp	Sp Cond	DO	DO	ORP	Pump Rate	Water level	Turbidity
min	units	°C	uS/cm	% sat.	ppm	mV	mL/min	Drawdown ft	NTU
3-5 min	+/- 0.1	NA	+/- 3%	+/- 10%	+/- 0.3ppm	+/- 10mV	*	< 0.33	+/- 10%

Stablization parameters for the last three readings

1006								12.77	
1007	8.59	12.6	155.1	61.3	6.35	+24.0	160	12.77	32.98
1012	8.29	12.3	136.8	40.9	4.34	+41.5	160	12.77	16.64
1017	7.67	12.4	87.9	41.7	4.43	+77.4	160	12.77	9.14
1022	7.52	12.4	84.3	43.4	4.60	+85.5	160	12.77	8.23
1027	7.34	12.3	82.2	45.2	4.80	+96.0	160	12.77	7.78
1028 1032	7.26	12.4	82.4	46.2	4.89	+99.6	160	12.77	7.76
1037	7.27	12.5	82.2	46.5	4.92	+101.4	160	12.77	7.60
1038									

Total Pump Time (min): 33 Total Purge Volume (gal): 1.4 Reviewed by: [Signature]

Weather: cloudy 43°F 11-04-20

Comments:

Bottles Filled		Preservative Codes: A - NONE B - HNO3 C - H2SO4 D - NaOH E - HCl F - _____							
Quantity	Size	Type	Preservative Code	Filtered Y/N	Quantity	Size	Type	Preservative Code	Filtered Y/N
2	125ml	HDPE	A	N					
2	↓	↓	B	N					
2	250ml	↓	A	N					
4	1L	↓	B	N					

* Pump rate should be <500 mL/min for low-flow and <1 gal/min for high Volume.

Consumers Energy Company
 Monitoring Well Sampling Worksheet

Well ID JAC MW-15006 Date 10-22-20 Control Number 20-1195-01
 Location JAC Well Material: PVC SS Iron Galv. Steel
 Purge Method: Peristaltic Submersible Fultz Bailer
 Depth to Water Tape: Geotech S/N: 1003

QC SAMPLE: MS/MSD DUP-04 Sonde ID: 08C 11M 15H 19M

Depth-to-water T/PVC (ft) 34.99 Depth-To-Bottom T/PVC (ft) 37.98 Completed by CET

Time	pH	Temp	Sp Cond	DO	DO	ORP	Pump Rate	Water level	Turbidity
min	units	°C	uS/cm	% sat.	ppm	mV	mL/min	Drawdown ft	NTU
3-5 min	+/- 0.1	NA	+/- 3%	+/- 10%	+/- 10%	+/- 10mV	*	< 0.33	+/- 10%

Stabilization parameters for the last three readings

1434							160	34.99	
1436	7.17	13.7	835	12.2	1.26	64.9	160	34.99	630.94
1441	7.24	13.8	829	10.9	1.12	30.4	160	34.99	247.41
1446	7.36	14.0	823	9.1	0.93	-19.4	160	34.99	82.92
1451	7.38	14.6	805	8.1	0.82	-39.7	160	34.99	29.76
1456	7.36	14.8	802	7.9	0.80	-42.2	160	34.99	24.49
1501	7.42	14.9	798	7.5	0.76	-44.5	160	34.99	17.24
1506	7.39	14.9	796	7.3	0.74	-46.1	160	34.99	14.85
1511	7.42	15.1	793	6.8	0.68	-49.1	160	34.99	11.92
1516	7.44	15.1	792	6.7	0.67	-49.4	160	34.99	11.34
1521	7.46	15.3	791	6.5	0.65	-50.8	160	34.99	10.22
1526	7.46	15.1	791	6.4	0.64	-51.4	160	34.99	9.37
1531	7.44	15.0	790	6.2	0.63	-54.7	160	34.99	8.71
1536	7.48	15.0	790	6.2	0.62	-55.4	160	34.99	8.78
1537									
1557									

Total Pump Time (min): 83 Total Purge Volume (gal): ~2.5 gal Reviewed by: [Signature]

Weather: _____ Date: 11-04-20

Comments: _____

Bottles Filled		Preservative Codes: A - NONE B - HNO3 C - H2SO4 D - NaOH E - HCl F - _____							
Quantity	Size	Type	Preservative Code	Filtered Y/N	Quantity	Size	Type	Preservative Code	Filtered Y/N
2	125ml	HDPE	B	~					
2	1		A						
2	250ml		A						
4	1000ml		B						

* Pump rate should be <500 mL/min for low-flow and <1 gal/min for high Volume.

Consumers Energy Company
Monitoring Well Sampling Worksheet

Well ID JHC-MW-15008-R Date 10-22-20 Control Number 20-1195-03
 Location JHC Well Material: PVC SS Iron Galv. Steel
 Purge Method: Peristaltic Submersible Fultz Bailor
 Depth to Water Tape: Go down S/N: 1003

QC SAMPLE: MS/MSD DUP- Sonde ID: 08C 11M 15H 19M

Depth-to-water T/PVC (ft) 45.00 Depth-To-Bottom T/PVC (ft) 47.60 Completed by CEY

Time	pH	Temp	Sp Cond	DO	DO	ORP	Pump Rate	Water level	Turbidity
min	units	°C	uS/cm	% sat.	ppm	mV	mL/min	Drawdown ft	NTU
3-5 min	+/- 0.1	NA	+/- 3%	+/- 10%	+/- 0.3ppm	+/- 10mV	*	< 0.33	+/- 10%

Stabilization parameters for the last three readings

1530							360	43.00	
1531	7.00	14.0	886	19.5	1.96	141.7	360	43.00	261.5
1536	6.95	14.4	889	13.1	1.26	82.1	360	43.00	123.65
1541	6.97	14.3	887	13.1	1.34	51.4	360	43.00	21.78
1546	6.97	14.3	883	14.6	1.49	46.0	360	43.00	12.86
1551	6.97	14.2	881	14.9	1.53	45.2	360	43.00	10.75
1556	6.97	14.3	879	16.0	1.64	45.3	360	43.00	10.26
1601	6.97	14.3	879	15.4	1.57	45.0	360	43.00	9.88
1606	6.97	14.3	879	15.4	1.58	44.8	360	43.00	8.75
1611	6.97	14.4	880	15.6	1.59	45.2	360	43.00	8.61
1612									
1620									

Total Pump Time (min): 50 Total Purge Volume (gal): 4.0 gal Reviewed by: [Signature]

Weather: _____

Comments: _____

Bottles Filled		Preservative Codes: A - NONE B - HNO3 C - H2SO4 D - NaOH E - HCl F -							
Quantity	Size	Type	Preservative Code	Filtered Y/N	Quantity	Size	Type	Preservative Code	Filtered Y/N
1	125ml	HPPE	B	Y					
1	1		A	Y					
1	250ml		A	Y					
2	1000ml		B	Y					

* Pump rate should be <500 mL/min for low-flow and <1 gal/min for high Volume.

Consumers Energy Company
 Monitoring Well Sampling Worksheet

Well ID JHC MW-15011 Date 10-22-20 Control Number 20-1195-06
 Location JHCampbell Well Material: PVC SS Iron Galv. Steel
 Purge Method: Peristaltic Submersible Fultz Bailor
 Depth to Water Tape: _____ S/N: _____

QC SAMPLE: MS/MSD DUP- Sonde ID: 08C 11M 15H 19M

Depth-to-water T/PVC (ft) 38.72 Depth-To-Bottom T/PVC (ft) _____ Completed by dmw

Time	pH	Temp	Sp Cond	DO	DO	ORP	Pump Rate	Water level	Turbidity
min	units	°C	uS/cm	% sat.	ppm	mV	mL/min	Drawdown ft	NTU
3-5 min	+/- 0.1	NA	+/- 3%	+/- 10%	+/- 0.3ppm	+/- 10mV	*	< 0.33	+/- 10%

Stabilization parameters for the last three readings

1623									
1624	7.06	14.6	836	10.8	1.06	-25.9	300		12.56
1629	7.52	14.7	823	4.8	0.48	-48.2	300		5.96
1634	7.56	14.7	815	4.2	0.42	-49.4	300		5.20
1639	7.57	14.7	809	3.9	0.38	-49.1	300		4.97
1644	7.57	14.7	803	3.6	0.36	-47.4	300		4.93
1649	7.57	14.7	800	3.5	0.35	-46.1	300		4.88
1650								38.72	

Total Pump Time (min): 27 Total Purge Volume (gal): 2.1 Reviewed by: [Signature]

Weather: _____ 11-04-20

Comments: _____

Bottles Filled		Preservative Codes: A - NONE B - HNO3 C - H2SO4 D - NaOH E - HCl F - _____							
Quantity	Size	Type	Preservative Code	Filtered Y/N	Quantity	Size	Type	Preservative Code	Filtered Y/N
1	125 ml	HOPE	A	N					
1	↓	↓	B	↓					
1	250 ml	↓	A	↓					
2	1L	↓	B	↓					

* Pump rate should be <500 mL/min for low-flow and <1 gal/min for high Volume.

Consumers Energy Company
Monitoring Well Sampling Worksheet

Well ID PZ 245 Date 10.21.20 Control Number 20-1197-02
 Location JH Campbell Well Material: PVC SS Iron Galv. Steel
 Purge Method: Peristaltic Submersible Fultz Bailer
 Depth to Water Tape: _____ S/N: _____

QC SAMPLE: MS/MSD DUP- Sonde ID: 08C 11M 15H 19M

Depth-to-water T/PVC (ft) 7.41 Depth-To-Bottom T/PVC (ft) _____ Completed by dmw

Time	pH	Temp	Sp Cond	DO	DO	ORP	Pump Rate	Water level	Turbidity
min	units	°C	uS/cm	% sat.	ppm	mV	mL/min	Drawdown ft	NTU
3-5 min	+/- 0.1	NA	+/- 3%	+/- 10%	+/- 0.3ppm	+/- 10mV	*	< 0.33	+/- 10%

Stabilization parameters for the last three readings

1217								7.45	
1218	6.18	13.1	29.0	22.1	2.29	+77.0	200	7.45	9.13
1223	5.26	13.2	27.1	17.6	1.84	+125.7	200	7.45	7.55
1228	5.16	13.0	27.6	17.6 +3.16.0	1.68	+130.0	200	7.45	6.88
1233	5.16	13.2	27.8	14.2	1.48	+129.1	200	7.45	7.64
1238	5.16	13.2	28.4	14.6	1.51	+125.9	200	7.45	7.71
1243	5.16	13.2	28.5	14.7	1.53	+123.5	200	7.45	7.75
1244									

Total Pump Time (min): 27 Total Purge Volume (gal): 1.4 Reviewed by: [Signature]

Weather: _____ 11-04-20

Comments:

Bottles Filled		Preservative Codes: A - NONE B - HNO3 C - H2SO4 D - NaOH E - HCl F - _____							
Quantity	Size	Type	Preservative Code	Filtered Y/N	Quantity	Size	Type	Preservative Code	Filtered Y/N
1	125 ml	HPLC	A						
1			B						
1	250 ml		A						
2	1L		B						

* Pump rate should be <500 mL/min for low-flow and <1 gal/min for high Volume.

Consumers Energy Company
 Monitoring Well Sampling Worksheet

Well ID MW-145 Date 10.20.20 Control Number 20-1197-01
 Location JH Campbell Well Material: PVC SS Iron Galv. Steel
 Purge Method: Peristaltic Submersible Fultz Bailer
 Depth to Water Tape: _____ S/N: _____

QC SAMPLE: MS/MSD DUP- Sonde ID: 08C 11M 15H 19M

Depth-to-water T/PVC (ft) 8.91 Depth-To-Bottom T/PVC (ft) _____ Completed by dmw

Time	pH	Temp	Sp Cond	DO	DO	ORP	Pump Rate	Water level	Turbidity
min	units	°C	uS/cm	% sat.	ppm	mV	mL/min	Drawdown ft	NTU
3-5 min	+/- 0.1	NA	+/- 3%	+/- 10%	+/- 0.3ppm	+/- 10mV	*	< 0.33	+/- 10%

Stablization parameters for the last three readings

1709								8.95	
1711	5.98	12.8	44.9	14.2	1.46	-5.8	160	8.95	30.53
1716	5.72	12.7	24.5 10.3	10.3 1.08	1.08	+65.8	160	8.95	12.39
1721	5.40	12.7	20.8 ^{dmw}	12.3 ^{10.20.20}	1.29	+103.2	160	8.95	10.11
1726	5.29	12.7	20.2	14.0	1.47	+125.5	160	8.95	9.84
1731	5.25	12.7	20.0	14.9	1.57	+142.6	160	8.95	9.36
1736	5.18	12.7	19.8	15.1	1.59	+163.5	160	8.95	9.14
1741	5.17	12.7	19.7	15.3	1.60	+166.1	160	8.95	9.31
1746	5.17	12.7	19.7	15.5	1.62	+171.8	160	8.95	9.26
1747									

Total Pump Time (min): 38 Total Purge Volume (gal): 1.6 Reviewed by: [Signature]

Weather: cloudy & windy; 52°F 11-04-20

Comments:

Bottles Filled		Preservative Codes: A - NONE B - HNO3 C - H2SO4 D - NaOH E - HCl F - _____							
Quantity	Size	Type	Preservative Code	Filtered Y/N	Quantity	Size	Type	Preservative Code	Filtered Y/N
1	125ml	HDPE	A	N					
1	↓	↓	B	↓					
1	250ml		A						
2	1L		B						

* Pump rate should be <500 mL/min for low-flow and <1 gal/min for high Volume.

Consumers Energy Company
 Monitoring Well Sampling Worksheet

Well ID PZ 405 Date 10.21.20 Control Number 20-1197-03
 Location JH Campbell Well Material: PVC SS Iron Galv. Steel
 Purge Method: Peristaltic Submersible Fultz Bailer
 Depth to Water Tape: _____ S/N: _____

QC SAMPLE: MS/MSD DUP- Sonde ID: 08C 11M 15H 19M

Depth-to-water T/PVC (ft) 10.90 Depth-To-Bottom T/PVC (ft) _____ Completed by dmw

Time	pH	Temp	Sp Cond	DO	DO	ORP	Pump Rate	Water level	Turbidity
min	units	°C	uS/cm	% sat.	ppm	mV	mL/min	Drawdown ft	NTU
3-5 min	+/- 0.1	NA	+/- 3%	+/- 10%	+/- 0.3ppm	+/- 10mV	*	<0.33	+/- 10%

Stablization parameters for the last three readings

0927								10.95	
0928	5.11	10.7	19.0	13.2	1.38	+189.9	200	10.95	13.36
0933	4.67	10.8	17.3	4.4	0.48	+206.3	200	10.95	10.17
0938	4.65	10.8	17.1	3.5	0.44	+211.4	200	10.95	9.75
0943	4.63	10.8	17.2	3.1	0.34	+215.8	200	10.95	9.48
0948	4.63	10.9	17.1	3.1	0.34	+216.6	200	10.95	9.32
0953	4.64	10.8	17.2	3.2	0.35	+215.2	200	10.95	9.51
0954									

Total Pump Time (min): 27 Total Purge Volume (gal): 1.4 Reviewed by: [Signature]

Weather: cloudy; 48°F 11-04-20

Comments:

Bottles Filled		Preservative Codes: A - NONE B - HNO3 C - H2SO4 D - NaOH E - HCl F - _____							
Quantity	Size	Type	Preservative Code	Filtered Y/N	Quantity	Size	Type	Preservative Code	Filtered Y/N
1	125 ml	HDPE	A	N					
1	↓	↓	B	↓					
1	250 ml	↓	A	↓					
2	1L	↓	B	↓					

* Pump rate should be <500 mL/min for low-flow and <1 gal/min for high Volume.

Consumers Energy Company
 Monitoring Well Sampling Worksheet

Well ID TW 19-04A Date 10.21.20 Control Number 20-1197-04
 Location JH Campbell Well Material: PVC SS Iron Galv. Steel
 Purge Method: Peristaltic Submersible Fultz Bailer
 Depth to Water Tape: _____ S/N: _____

QC SAMPLE: MS/MSD DUP- Sonde ID: 08C 11M 15H 19M

Depth-to-water T/PVC (ft) 22.17 Depth-To-Bottom T/PVC (ft) _____ Completed by dmw

Time	pH	Temp	Sp Cond	DO	DO	ORP	Pump Rate	Water level	Turbidity
min	units	°C	uS/cm	% sat.	ppm	mV	mL/min	Drawdown ft	NTU
3-5 min	+/- 0.1	NA	+/- 3%	+/- 10%	+/- 0.3ppm	+/- 10mV	*	< 0.33	+/- 10%

Stablization parameters for the last three readings

1734								22.20	
1735	6.97	12.8	535	21.1	2.18	+44.4	200	22.20	12.89
1740	7.03	12.9	450.6	9.3	0.98	+33.9	200	22.20	8.09
1745	7.00	13.0	444.8	12.6	1.31	+43.5	200	22.20	7.08
1750	6.98	12.9	443.5	13.2	1.38	+51.0	200	22.20	5.43
1755	6.97	13.0	444.5	13.3	1.39	+57.1	200	22.20	4.97
1800	6.97	12.9	443.3	13.5	1.40	+60.8	200	22.20	5.07
1801									

Total Pump Time (min): 27 Total Purge Volume (gal): 1.4 Reviewed by: [Signature]

Weather: _____ 11-04-20

Comments: _____

Bottles Filled		Preservative Codes: A - NONE B - HNO3 C - H2SO4 D - NaOH E - HCl F - _____							
Quantity	Size	Type	Preservative Code	Filtered Y/N	Quantity	Size	Type	Preservative Code	Filtered Y/N
3	125ml	HDPE	A	N					
3	↓		B	↓					
1	250ml	↓	A	↓					
2	1L		B	↓					

* Pump rate should be <500 mL/min for low-flow and <1 gal/min for high Volume.

Consumers Energy Company
 Monitoring Well Sampling Worksheet

Well ID TW 19-05 Date 10-21-20 Control Number 20-1197-05
 Location JH Campbell Well Material: PVC SS Iron Galv. Steel
 Purge Method: Peristaltic Submersible Fultz Bailer
 Depth to Water Tape: _____ S/N: _____

QC SAMPLE: MS/MSD DUP- Sonde ID: 08C 11M 15H 19M

Depth-to-water T/PVC (ft) 16.13 Depth-To-Bottom T/PVC (ft) _____ Completed by dmw

Time	pH	Temp	Sp Cond	DO	DO	ORP	Pump Rate	Water level	Turbidity
min	units	°C	uS/cm	% sat.	ppm	mV	mL/min	Drawdown ft	NTU
3-5 min	+/- 0.1	NA	+/- 3%	+/- 10%	+/- 0.3ppm	+/- 10mV	*	< 0.33	+/- 10%

Stablization parameters for the last three readings

1550								16.25	
1551	7.44	12.5	182.6	37.7	3.91	+29.5	240	16.25	9.80
1556	7.34	12.4	182.7	18.1	1.91	-2.5	240	16.25	9.71
1601	7.11	12.3	369.2	13.0	1.37	-51.6	240	16.25	9.64
1606	7.25	12.2	469.4	10.7	1.13	-31.8	240	16.25	9.70
1611	7.28	12.4	501	10.1	1.06	-24.1	240	16.25	9.25
1616	7.31	12.2	536	9.7	1.02	-14.7	240	16.25	9.01
1621	7.32	12.2	556	9.1	0.96	-8.2	240	16.25	8.99
1626	7.33	12.2	570	8.6	0.91	-4.9	240	16.25	8.90
1631	7.33	12.3	575	8.6	0.90	-1.5	240	16.25	8.84
1632									

Total Pump Time (min): 42 Total Purge Volume (gal): 2.6 Reviewed by: [Signature]

Weather: _____ 11-04-20

Comments: _____

Bottles Filled		Preservative Codes: A - NONE B - HNO3 C - H2SO4 D - NaOH E - HCl F - _____							
Quantity	Size	Type	Preservative Code	Filtered Y/N	Quantity	Size	Type	Preservative Code	Filtered Y/N
1	125ml	HDPE	A	N					
1	↓	↓	B	↓					
1	250ml	↓	A	↓					
2	1L	↓	B	↓					

* Pump rate should be <500 mL/min for low-flow and <1 gal/min for high Volume.

Consumers Energy Company
 Monitoring Well Sampling Worksheet

Well ID FW-1904A TW-1906A Date 10.21.20 Control Number 20-1197-06
 Location JH Campbell Well Material: PVC SS Iron Galv. Steel
 Purge Method: Peristaltic Submersible Fultz Bailer
 Depth to Water Tape: _____ S/N: _____

QC SAMPLE: MS/MSD DUP- Sonde ID: 08C 11M 15H 19M

Depth-to-water T/PVC (ft) 13.42 Depth-To-Bottom T/PVC (ft) _____ Completed by dmw

Time	pH	Temp	Sp Cond	DO	DO	ORP	Pump Rate	Water level	Turbidity
min	units	°C	uS/cm	% sat.	ppm	mV	mL/min	Drawdown ft	NTU
3-5 min	+/- 0.1	NA	+/- 3%	+/- 10%	+/- 0.3ppm	+/- 10mV	*	<0.33	+/- 10%

Stablization parameters for the last three readings

1654	7.84	12.9	144.0	43.2	4.32	17.2	260	13.45	
1655	7.84	12.9	144.0	43.2	4.32	+17.2	260	13.45	91.01
1700	7.49	12.8	126.8	4.4	0.46	-80.1	260	13.45	9.39
1705	7.39	12.9	128.7	3.5	0.37	-92.2	260	13.45	8.16
1710	7.37	12.7	128.4	3.3	0.35	-95.0	260	13.45	7.32
1715	7.36	12.8	130.1	3.2	0.33	-98.6	260	13.45	7.53
1720	7.36	12.8	130.6	3.1	0.33	-99.9	260	13.45	7.05
1721									

Total Pump Time (min): 27 Total Purge Volume (gal): 1.8 Reviewed by: J

Weather: _____ 11-04-20

Comments: _____

Bottles Filled		Preservative Codes: A - NONE B - HNO3 C - H2SO4 D - NaOH E - HCl F -							
Quantity	Size	Type	Preservative Code	Filtered Y/N	Quantity	Size	Type	Preservative Code	Filtered Y/N
1	125ml	HDPE	A	N					
1	250ml	↓	B	↓					
2	1L	↓	A	↓					
			B	↓					

* Pump rate should be <500 ml/min for low-flow and <1 gal/min for high Volume.

Consumers Energy Company
 Monitoring Well Sampling Worksheet

Well ID P2-235 Date 10.21.20 Control Number 20-1197-12
 Location JH Campbell well Well Material: PVC SS Iron Galv. Steel
 Purge Method: Peristaltic Submersible Fultz Bailor
 Depth to Water Tape: _____ S/N: _____

QC SAMPLE: MS/MSD DUP- Sonde ID: 08C 11M 15H 19M

Depth-to-water T/PVC (ft) 15.35 Depth-To-Bottom T/PVC (ft) _____ Completed by dmw

Time	pH	Temp	Sp Cond	DO	DO	ORP	Pump Rate	Water level	Turbidity
min	units	°C	uS/cm	% sat.	ppm	mV	mL/min	Drawdown ft	NTU
3-5 min	+/- 0.1	NA	+/- 3%	+/- 10%	+/- 0.3ppm	+/- 10mV	*	< 0.33	+/- 10%

Stabilization parameters for the last three readings

1354								15.41	
1355	5.80	14.0	35.6	94.3	9.60	+114.2	200	15.41	11.67
1400	6.18	13.9	44.8	87.0	8.88	+118.5	200	15.41	10.08
1405	6.30	13.8	47.7	86.0	8.80	+121.2	200	15.41	9.55
1410	6.38	13.9	49.2	85.6	8.75	+124.6	200	15.41	9.71
1415	6.43	13.9	49.7	85.4	8.73	+127.3	200	15.41	9.80
1420	6.44	13.9	50.0	85.4	8.72	+128.2	200	15.41	9.86
1421									

Total Pump Time (min): 27 Total Purge Volume (gal): 1.4 Reviewed by: [Signature]

Weather: cloudy; 52°F 11-04-20

Comments:

Bottles Filled		Preservative Codes: A - NONE B - HNO3 C - H2SO4 D - NaOH E - HCl F - _____							
Quantity	Size	Type	Preservative Code	Filtered Y/N	Quantity	Size	Type	Preservative Code	Filtered Y/N
1	125 ml	HDRG	A	N					
1	↓	↓	B	↓					
1	250 ml		A						
2	1L		B						

* Pump rate should be <500 mL/min for low-flow and <1 gal/min for high Volume.

Consumers Energy Company
 Monitoring Well Sampling Worksheet

Well ID P224 Date 10.21.20 Control Number 20-1197-13
 Location JH Campbell Well Material: PVC SS Iron Galv. Steel
 Purge Method: Peristaltic Submersible Fultz Bailer
 Depth to Water Tape: _____ S/N: _____

QC SAMPLE: MS/MSD DUP- Sonde ID: 08C 11M 15H 19M

Depth-to-water T/PVC (ft) 4.90 Depth-To-Bottom T/PVC (ft) 13.83 Completed by dmw

Time	pH	Temp	Sp Cond	DO	DO	ORP	Pump Rate	Water level	Turbidity
min	units	°C	uS/cm	% sat.	ppm	mV	mL/min	Drawdown ft	NTU
3-5 min	+/- 0.1	NA	+/- 3%	+/- 10%	+/- 0.3ppm	+/- 10mV	*	< 0.33	+/- 10%

Stablization parameters for the last three readings

1039								5.33	
1043	6.38	12.5	194.0	11.3	1.19	-186.0	100	5.86	104.01
1048	6.65	12.4	211.5	7.3	0.77	-196.2	100	6.11	83.26
1053	6.78	12.4	233.3	4.2	0.45	-178.2	100	6.18	41.18
1058	6.81	12.3	247.3	3.0	0.32	-163.4	100	6.24	9.96
1103	6.82	12.3	248.5	3.0	0.31	-162.0	100	6.25	9.87
1108	6.81	12.4	250.4	2.8	0.30	-158.5	100	6.26	9.95
1109									

Total Pump Time (min): 30 Total Purge Volume (gal) : 0.8 Reviewed by: [Signature]

Weather: _____ 11-04-20

Comments:

Bottles Filled		Preservative Codes: A - NONE B - HNO3 C - H2SO4 D - NaOH E - HCl F - _____							
Quantity	Size	Type	Preservative Code	Filtered Y/N	Quantity	Size	Type	Preservative Code	Filtered Y/N
1	125 ml	None	A	N					
1	250 ml		B						
1	250 ml		A						
2	1L		B						

* Pump rate should be <500 mL/min for low-flow and <1 gal/min for high Volume.

Consumers Energy Company
 Monitoring Well Sampling Worksheet

Well ID P2-40 Date 10.21.20 Control Number 20-1197-14
 Location JH Campbell Well Material: PVC SS Iron Galv. Steel
 Purge Method: Peristaltic Submersible Fultz Bailer
 Depth to Water Tape: _____ S/N: _____

QC SAMPLE: MS/MSD DUP- 09 Sonde ID: 08C 11M 15H 19M

Depth-to-water T/PVC (ft) 809 Depth-To-Bottom T/PVC (ft) 22.54 Completed by dmw

Time	pH	Temp	Sp Cond	DO	DO	ORP	Pump Rate	Water level	Turbidity
min	units	°C	uS/cm	% sat.	ppm	mV	mL/min	Drawdown ft	NTU
3-5 min	+/- 0.1	NA	+/- 3%	+/- 10%	+/- 0.3ppm	+/- 10mV	*	< 0.33	+/- 10%

Stabilization parameters for the last three readings

<u>0833</u>								<u>8.11</u>	
<u>0834</u>	<u>5.66</u>	<u>10.4</u>	<u>73.6</u>	<u>22.1</u>	<u>2.39</u>	<u>+194.5</u>	<u>200</u>	<u>8.11</u>	<u>9.42</u>
<u>0839</u>	<u>5.80</u>	<u>10.1</u>	<u>82.4</u>	<u>11.7</u>	<u>1.30</u>	<u>+135.5</u>	<u>200</u>	<u>8.11</u>	<u>9.22</u>
<u>0844</u>	<u>5.83</u>	<u>10.1</u>	<u>82.5</u>	<u>11.2</u>	<u>1.25</u>	<u>+135.1</u>	<u>200</u>	<u>8.11</u>	<u>9.38</u>
<u>0849</u>	<u>5.85</u>	<u>10.1</u>	<u>82.7</u>	<u>11.0</u>	<u>1.23</u>	<u>+141.0</u>	<u>200</u>	<u>8.11</u>	<u>9.41</u>
<u>0850</u>									

Total Pump Time (min): 17 Total Purge Volume (gal): -1.0 Reviewed by: [Signature]

Weather: cloudy; 48°F 11-04-20

Comments: 8.19 gal

Bottles Filled		Preservative Codes: A - NONE B - HNO3 C - H2SO4 D - NaOH E - HCl F -							
Quantity	Size	Type	Preservative Code	Filtered Y/N	Quantity	Size	Type	Preservative Code	Filtered Y/N
<u>2</u>	<u>125ml</u>	<u>HDRG</u>	<u>A</u>	<u>N</u>					
<u>2</u>	<u>↓</u>	<u>↓</u>	<u>B</u>	<u>↓</u>					
<u>2</u>	<u>250ml</u>	<u>↓</u>	<u>A</u>	<u>↓</u>					
<u>4</u>	<u>1L</u>	<u>↓</u>	<u>B</u>	<u>↓</u>					

* Pump rate should be <500 mL/min for low-flow and <1 gal/min for high Volume.

Consumers Energy Company
 Monitoring Well Sampling Worksheet

Well ID MW-9AR Date 10.21.20 Control Number 20-1197-16
 Location JH Campbell Well Material: PVC SS Iron Galv. Steel
 Purge Method: Peristaltic Submersible Fultz Bailor
 Depth to Water Tape: _____ S/N: _____

QC SAMPLE: MS/MSD DUP- Sonde ID: 08C 11M 15H 19M

Depth-to-water T/PVC (ft) 21.35 Depth-To-Bottom T/PVC (ft) _____ Completed by dmw

Time	pH	Temp	Sp Cond	DO	DO	ORP	Pump Rate	Water level	Turbidity
min	units	°C	uS/cm	% sat.	ppm	mV	mL/min	Drawdown ft	NTU
3-5 min	+/- 0.1	NA	+/- 3%	+/- 10%	+/- 0.3ppm	+/- 10mV	*	< 0.33	+/- 10%

Stablization parameters for the last three readings

1459								21.35	
1501	6.68	14.5	561	25.9	2.60	+110.9	180	21.35	5.93
1506	6.98	14.9	460.2	31.8	3.19	+94.2	180	21.35	5.28
1511	7.07	14.7	445.8	37.3	3.74	+88.9	180	21.35	5.10
1516	7.11	14.7	443.9	39.0	3.91	+87.5	180	21.35	5.23
1521	7.12	14.8	444.5	39.7	3.97	+87.4	180	21.35	5.14
1522									

Total Pump Time (min): 23 Total Purge Volume (gal): 1.1 Reviewed by: _____

Weather: _____

Comments: _____

Bottles Filled		Preservative Codes: A - NONE B - HNO3 C - H2SO4 D - NaOH E - HCl F - _____							
Quantity	Size	Type	Preservative Code	Filtered Y/N	Quantity	Size	Type	Preservative Code	Filtered Y/N
1	125 ml	HNO3	B	Y					
1			B	N					

* Pump rate should be <500 mL/min for low-flow and <1 gal/min for high Volume.

Appendix C

Nature and Extent Data Summary

Technical Memorandum

Date: January 30, 2021

To: Bethany Swanberg, Consumers Energy

From: Sarah Holmstrom, TRC
Kristin Lowery, TRC

cc: Brad Runkel, Consumers Energy

Project No.: 367390.0000

Subject: 2020 Nature and Extent Data Summary, JH Campbell Pond A, Consumers Energy, West Olive, Michigan

In response to the United States Environmental Protection Agency's (U.S. EPA's) Resource Conservation and Recovery Act (RCRA) Coal Combustion Residual rule ("CCR Rule") promulgated on April 17, 2015, as amended, Consumers Energy Company (Consumers Energy) has conducted groundwater monitoring at the JH Campbell (JHC) Pond A CCR Unit. During the statistical evaluation of the initial assessment monitoring event (June 2018) for Pond A, arsenic was present in one or more downgradient monitoring well(s) at statistically significant levels exceeding the Groundwater Protection Standards (GWPSs)¹.

The CCR Rule 40 CFR §257.96(a) requires that an owner or operator initiate an assessment of corrective measures (ACM) 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* (ACM) (TRC, September 2019) was initiated on April 15, 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.

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 consist of Appendix III and IV constituents collected from the background and downgradient CCR monitoring well networks and from supplemental downgradient wells in the EGLE-approved JHC Dry Ash Landfill Hydrogeological Monitoring Plan (HMP)² monitoring network. In addition to the existing HMP wells, TRC, on behalf of Consumers

¹ TRC. 2019. *Statistical Evaluation of Initial Assessment Monitoring Sampling Event, JH Campbell Pond A CCR Unit, Consumers Energy Company, West Olive, Michigan*. January 14.

² Consumers Power Company. 1996. *Hydrogeological Monitoring Plan for JH Campbell Ash Storage Facility, Consumers Power Company, Solid Waste Disposal Area, Coal Ash, Type III*. September.

Technical Memorandum

Energy, installed shallow and deep step out wells (MW-14S, MW-14D, PZ-23S, PZ-23D, PZ-24S, PZ-24D, PZ-40S) nested with existing downgradient wells MW-14, PZ-23, PZ-24, and PZ-40 (shallow well only) in April 2018 to further characterize the horizontal and vertical distribution of Appendix III and IV constituents in groundwater downgradient from the CCR units. Several of these monitoring wells (MW-14S, PZ-24S, PZ-40S), in addition to existing HMP monitoring well MW-13, were also incorporated into the EGLE-approved *Pond A Assessment Monitoring Plan* (Pond A AMP) (TRC, July 2019), which was developed to comply with the Michigan Part 115 program. Five shallow and deep step-out temporary monitoring wells were installed downgradient of Pond A (TW-19-04A, TW-19-04B, TW-19-05, TW-19-06A, and TW-19-06B) in June 2019. The locations of the additional downgradient step out wells are shown on Figure 1. Nature and extent sampling in 2020 included shallow step-out wells in addition to wells and parameters monitored quarterly as part of the Pond A HMP. A summary of the nature and extent groundwater data collected in 2020 are provided on Table 1. The TDS data collected from the supplemental downgradient wells during the October 2020 event contained potential errors introduced from inaccurate pre-determined bag weights provided by the lab materials manufacturer and results varied significantly from historical data at each of the monitoring wells; therefore, the TDS data have been considered unusable for the purposes of the nature and extent monitoring program. The soil boring logs and well construction diagrams for the step out monitoring wells utilized for the nature and extent groundwater sampling are included in Appendix A of the *2019 Annual Groundwater Monitoring and Corrective Action Report and Fourth Quarter 2019 Hydrogeological Monitoring Report* (TRC, January 2020).

As discussed in the ACM, the nature and extent of contamination (e.g. 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 onsite drinking water wells downgradient from Pond A 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. Several Appendix III and IV constituents exceed the Michigan Part 201 generic groundwater-surface water interface (GSI) criteria in on-site wells; however, compliance for the GSI pathway is currently met for the Appendix III and IV constituents, including arsenic, based on data collected from the step out wells/GSI monitoring wells and the National pollutant Discharge Elimination System (NPDES) outfall at the Recirculation Pond. Compliance for the GSI pathway will continue to be monitored in accordance with the EGLE-approved Pond A AMP.

Table

Table 1
 Summary of Groundwater Sampling Results (Analytical): February 2020 - October 2020
 JH Campbell Nature and Extent Wells – RCRA CCR Monitoring Program
 West Olive, Michigan

		Sample Location:				MW-14S				PZ-23S			
		Sample Date:				2/11/2020	4/16/2020	7/16/2020	10/20/2020	2/11/2020	4/16/2020	7/15/2020	10/21/2020
Constituent	Unit	EPA MCL	MI Residential*	MI Non-Residential*	MI GSI [^]								
Appendix III													
Boron	ug/L	NC	500	500	7,200	28	21	28	44	30	22	113	25
Calcium	mg/L	NC	NC	NC	500 ⁽²⁾	2.32	2.14	1.82	6.39	--	7.48	--	10.7
Chloride	mg/L	250**	250 ⁽¹⁾	250 ⁽¹⁾	500 ⁽²⁾	< 1.00	< 1.00	< 1.00	< 1.00	--	< 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**	250 ⁽¹⁾	250 ⁽¹⁾	500 ⁽²⁾	3.15	2.29	2.80	2.78	--	3.83	--	3.05
Total Dissolved Solids	mg/L	500**	500⁽¹⁾	500⁽¹⁾	500	22	29	33	NA ⁽³⁾	--	40	--	NA ⁽³⁾
pH, Field	SU	6.5 - 8.5**	6.5 - 8.5⁽¹⁾	6.5 - 8.5⁽¹⁾	6.5 - 9.0	5.8	5.0	5.4	5.2	7.2	6.6	6.8	6.4
Appendix IV													
Antimony	ug/L	6	6.0	6.0	130	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Arsenic	ug/L	10	10	10	10	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Barium	ug/L	2,000	2,000	2,000	820	8	8	9	8	--	< 5	--	< 5
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	2	< 1	< 1
Cobalt	ug/L	NC	40	100	100	< 6	< 15	< 6	< 6	--	< 15	--	< 15
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	< 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	6	6	8	6
Radium-226	pCi/L	NC	NC	NC	NC	--	< 0.172	--	< 0.493	--	< 0.131	--	< 0.475
Radium-228	pCi/L	NC	NC	NC	NC	--	< 0.414	--	< 0.383	--	< 0.403	--	< 0.294
Radium-226/228	pCi/L	5	NC	NC	NC	--	0.450	--	< 0.493	--	< 0.403	--	< 0.475
Selenium	ug/L	50	50	50	5.0	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Thallium	ug/L	2	2.0	2.0	3.7	< 2	< 2	< 2	< 2	--	< 2	--	< 2
Michigan Part 115 Parameters													
Iron	ug/L	300**	300⁽¹⁾	300⁽¹⁾	500,000 ⁽²⁾	278	75	151	102	--	134	--	--
Copper	ug/L	1,000**	1,000 ⁽¹⁾	1,000 ⁽¹⁾	15	1	< 1	5	< 1	--	< 1	--	--
Nickel	ug/L	NC	100	100	86	< 1	< 1	< 2	< 2	< 2	< 1	< 2	--
Silver	ug/L	100**	34	98	0.2	< 0.2	< 0.2	< 0.2	< 0.2	--	< 0.2	--	--
Vanadium	ug/L	NC	4.5	62	27	< 2	< 2	< 2	< 2	< 2	< 2	< 2	--
Zinc	ug/L	5,000**	2,400	5,000 ⁽¹⁾	190	11	< 10	17	< 10	--	< 10	--	--

Notes:

ug/L - micrograms per liter.

mg/L - milligrams per liter.

SU - standard units; pH is a field parameter.

pCi/L - picocuries per liter.

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

NA - not applicable.

NC - no criteria.

-- - not analyzed.

* - Michigan Part 201 Generic Drinking Water Cleanup Criteria, December 30, 2013.

** - 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 EGLE policy and procedure 09-014 dated June 20, 2012.

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.

(1) - Criterion is the aesthetic drinking water value per footnote {E}.

(2) - Criterion is based on the total dissolved solids GSI value per footnote {EE}.

(3) - Total dissolved solids data for the October 2020 event contained errors introduced by the laboratory materials manufacturer and were determined to be unusable.

Table 1
 Summary of Groundwater Sampling Results (Analytical): February 2020 - October 2020
 JH Campbell Nature and Extent Wells – RCRA CCR Monitoring Program
 West Olive, Michigan

Sample Location:						PZ-24		PZ-24S			
Sample Date:						4/16/2020	10/21/2020	2/11/2020	4/16/2020	7/16/2020	10/21/2020
Constituent	Unit	EPA MCL	MI Residential*	MI Non-Residential*	MI GSI [^]						
Appendix III											
Boron	ug/L	NC	500	500	7,200	176	183	26	< 20	57	42
Calcium	mg/L	NC	NC	NC	500 ⁽²⁾	20.9	26.0	2.39	3.16	2.88	7.58
Chloride	mg/L	250**	250 ⁽¹⁾	250 ⁽¹⁾	500 ⁽²⁾	2.51	5.49	< 1.00	< 1.00	< 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**	250 ⁽¹⁾	250 ⁽¹⁾	500 ⁽²⁾	31.3	15.2	2.59	2.73	2.62	3.06
Total Dissolved Solids	mg/L	500**	500⁽¹⁾	500⁽¹⁾	500	157	NA ⁽³⁾	42	28	61	NA ⁽³⁾
pH, Field	SU	6.5 - 8.5**	6.5 - 8.5⁽¹⁾	6.5 - 8.5⁽¹⁾	6.5 - 9.0	6.9	6.8	5.6	5.0	5.5	5.2
Appendix IV											
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	13	15	25	24	28	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	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium	ug/L	100	100	100	11	1	< 1	2	2	2	1
Cobalt	ug/L	NC	40	100	100	< 15	< 15	< 6	< 15	< 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	11	9	< 5	< 5	< 5	< 5
Radium-226	pCi/L	NC	NC	NC	NC	0.274	< 0.734	--	< 0.156	--	< 0.538
Radium-228	pCi/L	NC	NC	NC	NC	< 0.480	< 0.390	--	< 0.376	--	0.517
Radium-226/228	pCi/L	5	NC	NC	NC	< 0.480	< 0.734	--	< 0.376	--	< 0.538
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
Michigan Part 115 Parameters											
Iron	ug/L	300**	300⁽¹⁾	300⁽¹⁾	500,000 ⁽²⁾	8,100	--	283	488	687	552
Copper	ug/L	1,000**	1,000 ⁽¹⁾	1,000 ⁽¹⁾	15	< 1	--	2	< 1	1	2
Nickel	ug/L	NC	100	100	86	< 1	--	2	< 1	< 2	< 2
Silver	ug/L	100**	34	98	0.2	< 0.2	--	< 0.2	< 0.2	< 0.2	< 0.2
Vanadium	ug/L	NC	4.5	62	27	3	--	< 2	2	3	3
Zinc	ug/L	5,000**	2,400	5,000 ⁽¹⁾	190	32	--	< 10	< 10	19	< 10

Notes:

ug/L - micrograms per liter.

mg/L - milligrams per liter.

SU - standard units; pH is a field parameter.

pCi/L - picocuries per liter.

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

NA - not applicable.

NC - no criteria.

-- - not analyzed.

* - Michigan Part 201 Generic Drinking Water Cleanup Criteria, December 30, 2013.

** - 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 EGLE policy and procedure 09-014 dated June 20, 2012.

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.

(1) - Criterion is the aesthetic drinking water value per footnote {E}.

(2) - Criterion is based on the total dissolved solids GSI value per footnote {EE}.

(3) - Total dissolved solids data for the October 2020 event contained errors introduced by the laboratory materials manufacturer and were deterr

Table 1
 Summary of Groundwater Sampling Results (Analytical): February 2020 - October 2020
 JH Campbell Nature and Extent Wells – RCRA CCR Monitoring Program
 West Olive, Michigan

Sample Location:						PZ-40		PZ-40S			
Sample Date:						4/16/2020	10/21/2020	2/11/2020	4/14/2020	7/16/2020	10/21/2020
Constituent	Unit	EPA MCL	MI Residential*	MI Non-Residential*	MI GSI [^]						
Appendix III											
Boron	ug/L	NC	500	500	7,200	153	67	< 20	< 20	30	27
Calcium	mg/L	NC	NC	NC	500 ⁽²⁾	11.2	12.6	1.36	1.65	1.35	3.51
Chloride	mg/L	250**	250 ⁽¹⁾	250 ⁽¹⁾	500 ⁽²⁾	2.58	2.85	< 1.00	< 1.00	< 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**	250 ⁽¹⁾	250 ⁽¹⁾	500 ⁽²⁾	13.3	8.62	2.65	2.72	2.47	1.51
Total Dissolved Solids	mg/L	500**	500⁽¹⁾	500⁽¹⁾	500	79	NA ⁽³⁾	30	33	33	NA ⁽³⁾
pH, Field	SU	6.5 - 8.5**	6.5 - 8.5⁽¹⁾	6.5 - 8.5⁽¹⁾	6.5 - 9.0	5.9	5.9	5.1	4.4	4.9	4.6
Appendix IV											
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	15	12	25	22	19	19
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	2
Cobalt	ug/L	NC	40	100	100	< 15	< 15	< 6	< 15	< 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	7	6	< 5	< 5	< 5	< 5
Radium-226	pCi/L	NC	NC	NC	NC	< 0.165	< 0.548	--	< 0.142	--	< 0.614
Radium-228	pCi/L	NC	NC	NC	NC	< 0.356	< 0.302	--	< 0.370	--	< 0.442
Radium-226/228	pCi/L	5	NC	NC	NC	0.392	< 0.548	--	< 0.370	--	< 0.614
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
Michigan Part 115 Parameters											
Iron	ug/L	300**	300⁽¹⁾	300⁽¹⁾	500,000 ⁽²⁾	69	--	144	168	174	582
Copper	ug/L	1,000**	1,000 ⁽¹⁾	1,000 ⁽¹⁾	15	< 1	--	1	< 1	2	2
Nickel	ug/L	NC	100	100	86	< 1	--	< 1	< 1	< 2	< 2
Silver	ug/L	100**	34	98	0.2	< 0.2	--	< 0.2	< 0.2	< 0.2	< 0.2
Vanadium	ug/L	NC	4.5	62	27	< 2	--	< 2	< 2	< 2	< 2
Zinc	ug/L	5,000**	2,400	5,000 ⁽¹⁾	190	< 10	--	< 10	< 10	19	< 10

Notes:

ug/L - micrograms per liter.

mg/L - milligrams per liter.

SU - standard units; pH is a field parameter.

pCi/L - picocuries per liter.

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

NA - not applicable.

NC - no criteria.

-- - not analyzed.

* - Michigan Part 201 Generic Drinking Water Cleanup Criteria, December 30, 2013.

** - 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 EGLE policy and procedure 09-014 dated June 20, 2012.

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.

(1) - Criterion is the aesthetic drinking water value per footnote {E}.

(2) - Criterion is based on the total dissolved solids GSI value per footnote {EE}.

(3) - Total dissolved solids data for the October 2020 event contained errors introduced by the laboratory materials manufacturer and were deterr

Table 1
 Summary of Groundwater Sampling Results (Analytical): February 2020 - October 2020
 JH Campbell Nature and Extent Wells – RCRA CCR Monitoring Program
 West Olive, Michigan

		Sample Location:				TW-19-04A			TW-19-05			TW-19-06A		
		Sample Date:				2/11/2020	4/14/2020	10/21/2020	2/11/2020	4/16/2020	10/21/2020	2/11/2020	4/16/2020	10/21/2020
Constituent	Unit	EPA MCL	MI Residential*	MI Non-Residential*	MI GSI [^]									
Appendix III														
Boron	ug/L	NC	500	500	7,200	1,350	760	1,610	79	95	152	228	210	214
Calcium	mg/L	NC	NC	NC	500 ⁽²⁾	58.0	54.6	60.9	22.1	38.6	74.2	20.7	19.6	18.3
Chloride	mg/L	250**	250 ⁽¹⁾	250 ⁽¹⁾	500 ⁽²⁾	3.03	3.28	1.18	1.10	5.67	22.5	< 1.00	< 1.00	1.10
Fluoride	ug/L	4,000	NC	NC	NC	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	250**	250 ⁽¹⁾	250 ⁽¹⁾	500 ⁽²⁾	31.9	28.6	37.3	6.35	49.7	80.3	11.2	10.8	8.47
Total Dissolved Solids	mg/L	500**	500⁽¹⁾	500⁽¹⁾	500	242	234	NA ⁽³⁾	81	199	NA ⁽³⁾	113	107	NA ⁽³⁾
pH, Field	SU	6.5 - 8.5**	6.5 - 8.5⁽¹⁾	6.5 - 8.5⁽¹⁾	6.5 - 9.0	7.6	7.2	7.0	7.9	7.3	7.3	7.8	6.6	7.4
Appendix IV														
Antimony	ug/L	6	6.0	6.0	130	3	3	3	3	2	2	< 1	< 1	< 1
Arsenic	ug/L	10	10	10	10	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Barium	ug/L	2,000	2,000	2,000	820	78	71	86	6	12	26	7	8	6
Beryllium	ug/L	4	4.0	4.0	18	< 1	< 1	< 1	< 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	< 0.2	< 0.2	< 0.2
Chromium	ug/L	100	100	100	11	< 1	< 1	< 1	1	< 1	< 1	< 1	< 1	< 1
Cobalt	ug/L	NC	40	100	100	< 6	< 15	< 6	< 6	< 15	< 6	< 6	< 15	< 6
Fluoride	ug/L	4,000	NC	NC	NC	< 1,000	< 1,000	< 1,000	< 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	< 1	< 1	< 1
Lithium	ug/L	NC	170	350	440	19	18	21	17	20	26	< 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	< 0.2	< 0.2	< 0.2
Molybdenum	ug/L	NC	73	210	3,200	166	69	56	< 5	< 5	< 5	56	41	24
Radium-226	pCi/L	NC	NC	NC	NC	--	0.162	< 0.475	--	< 0.119	< 0.382	--	< 0.204	< 0.442
Radium-228	pCi/L	NC	NC	NC	NC	--	< 0.381	< 0.420	--	< 0.386	< 0.172	--	< 0.403	< 0.332
Radium-226/228	pCi/L	5	NC	NC	NC	--	< 0.381	0.576	--	< 0.386	< 0.382	--	< 0.403	< 0.442
Selenium	ug/L	50	50	50	5.0	162	213	308	38	31	19	7	13	< 1
Thallium	ug/L	2	2.0	2.0	3.7	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2
Michigan Part 115 Parameters														
Iron	ug/L	300**	300⁽¹⁾	300⁽¹⁾	500,000 ⁽²⁾	35	38	< 20	71	23	< 20	265	200	134
Copper	ug/L	1,000**	1,000 ⁽¹⁾	1,000 ⁽¹⁾	15	< 1	< 1	< 1	1	1	2	1	1	< 1
Nickel	ug/L	NC	100	100	86	1	< 1	< 2	2	< 1	< 2	< 1	< 1	< 2
Silver	ug/L	100**	34	98	0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Vanadium	ug/L	NC	4.5	62	27	< 2	< 2	< 2	< 2	< 2	< 2	< 2	2	< 2
Zinc	ug/L	5,000**	2,400	5,000 ⁽¹⁾	190	< 10	14	< 10	< 10	< 10	< 10	< 10	< 10	< 10

Notes:

- ug/L - micrograms per liter.
- mg/L - milligrams per liter.
- SU - standard units; pH is a field parameter.
- pCi/L - picocuries per liter.
- MCL - Maximum Contaminant Level, EPA Drinking Water Standards and Health Advisories, April 2012.
- NA - not applicable.
- NC - no criteria.
- - not analyzed.
- * - Michigan Part 201 Generic Drinking Water Cleanup Criteria, December 30, 2013.
- ** - 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 EGLE policy and procedure 09-014 dated June 20, 2012.
- 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.
- (1) - Criterion is the aesthetic drinking water value per footnote {E}.
- (2) - Criterion is based on the total dissolved solids GSI value per footnote {EE}.
- (3) - Total dissolved solids data for the October 2020 event contained errors introduced by the laboratory materials manufacturer and were determined.

Figure

Appendix D

Semiannual Progress Report

January 30, 2021

Subject:

Semiannual Progress Report - Selection of Remedy
 JH Campbell Bottom Ash Ponds 1-2 CCR Unit
 JH Campbell Pond A CCR Unit

This Semiannual Progress Report, prepared as a requirement of §257.97(a) of 40 CFR Parts 257 and 261, Disposal of Coal Combustion Residuals from Electric Utilities, under subtitle D of the Resource Conservation and Recovery Act (RCRA), also known as the Coal Combustion Residuals (CCR) rule, describes progress toward selecting and designing remedies for two CCR units that triggered Assessment of Corrective Measures (ACM) under the CCR Rule at the JH Campbell Solid Waste Disposal Area: Bottom Ash Ponds 1-2 and Pond A. Based on the schedule of self-implementation prescribed in the CCR Rule, a progress report is required to be prepared semiannually upon completion of the Assessment of Corrective Measures Report until the remedy is selected. It is noteworthy that remedy selection for the Bottom Ash Ponds 1-2 and Pond A, prescribed by the CCR Rule, is being undertaken in coordination with a Michigan Department of Environment, Great Lakes, and Energy (EGLE) Consent Agreement 115-01-2018, which was executed on December 28, 2018.

Consumers Energy (CE) reported statistically significant exceedances above the groundwater protection standard (GWPS) for a single Appendix IV constituent, arsenic, in the "Notification of Appendix IV Constituent Exceeding Groundwater Protection Standard per §257.95(g)" (Consumers Energy Company, January 2019).

Unit with GWPS Exceedance	Constituent	# of Downgradient Wells Observed
Pond A	Arsenic	1 of 6
Bottom Ash Ponds 1-2	Arsenic	2 of 5

Subsequently, Assessment of Corrective Measures Reports (TRC, September 2019) were completed on September 11, 2019 for Bottom Ash Ponds 1-2 and Pond A.

An initial semi-annual progress report dated January 30th, 2020 was made available on the CE public-facing website as part of the "2019 Annual Groundwater Monitoring and Corrective Action Report" (TRC, January 2020) for Bottom Ash Ponds 1-2 and Pond A.

Assessment Activities

Bottom Ash Ponds 1-2

Consumers Energy has performed CCR removal at Bottom Ash Ponds 1-2 as documented in the "JH Campbell Generating Facility Bottom Ash Ponds 1-2 Closure Plan," (Golder, January 2018). Following the permanent cessation of hydraulic loading, CCR removal activities were completed in October 2018. On October 22, 2019 EGLE provided written concurrence that all bottom ash had been removed from Bottom Ash Ponds 1-2 based on multiple lines of evidence described in the approved closure work plan.

Consumers Energy continues to monitor Bottom Ash Ponds 1-2 semiannually for Appendix III and IV constituents.

Pond A

Consumers Energy closed Pond A according to the "JH Campbell Generating Facility Pond A Closure Plan, West Olive, Michigan" (Golder, October 2016) and an updated closure plan detailing the final cover system submitted to EGLE in February 2019. The state closure certification as required by Paragraph 4.2 of Consent Agreement WMRPD No. 115-01-2018 was approved by EGLE on November 25, 2019.

Since the installation of the final cover, three rounds of semiannual sampling have been conducted at Pond A. In accordance with Consent Agreement 115-01-2018, a revised Hydrogeological Monitoring Plan, *Pond A Hydrogeological Monitoring Plan, JH Campbell Power Plant, West Olive, Michigan* (HMP) (TRC, March 2019; Revised July 2019) was submitted to EGLE and approved in August 2019. The Pond A well network is being sampled quarterly under the EGLE-approved HMP.

2020 Data Analysis

Analytical results and details of the statistical evaluations from semiannual sampling are detailed in the respective "2020 Annual Groundwater Monitoring and Corrective Action Report" (TRC, January 2021) for each unit, to which this memo is appended. A summary of the results is included below.

Bottom Ash Ponds 1-2

Arsenic concentrations at MW-15002 reached a local maximum in 2018, during the same time period that significant earthwork was being completed to remove ash from the pond. There has been a steady decrease in observed concentrations of arsenic at MW-15002 since ash removal was completed, including the most recent results collected in 2020. Concentrations of arsenic at MW-15003 have remained steady at or near the GWPS since 2018.

Since the cessation of hydraulic loading and removal of CCR at Bottom Ash Ponds 1-2, groundwater flow direction has changed significantly and MW-15002 and MW-15003 are no longer downgradient of the former CCR unit. Concentrations at these wells are not necessarily representative of groundwater that is solely influenced by Bottom Ash Ponds 1-2. The wells continue to be monitored to evaluate groundwater quality since the removal of CCR.

As detailed in Section 4.1 of the *2020 Annual Groundwater Monitoring and Corrective Action Report*" (TRC, January 2021) for Bottom Ash Ponds 1-2, Nature and Extent sampling performed pursuant to 257.95(g)(1) demonstrates that arsenic is not observed at levels which threaten human health or the environment in downgradient wells, and exceedances of the GWPS for arsenic are limited to Consumers Energy property near the solid waste boundary of the former unit.

Pond A

Arsenic concentrations exceed the GWPS at a single well, MW-15011. These concentrations reached an apparent local maximum coincidental to the installation of the final cover system in 2019. Subsequent rounds of quarterly and semiannual sampling for arsenic at MW-15011 show a visual decline since final cover installation. Semiannual sampling results in 2020 may indicate that arsenic concentrations are equilibrating.

No additional statistically significant observations were made in the 2020 data set. Nature and Extent sampling continues to demonstrate the arsenic is not found at wells downgradient of Pond A at levels which exceed the GWPS. The dewatering of the impoundment in 2018 followed by the

completion of the final cover in 2019 has changed groundwater flow direction. Mounding is no longer observed near the unit, and static water levels have dropped by multiple feet.

Conclusions

Bottom Ash Ponds 1-2

The general decrease in arsenic concentrations suggest that source removal continues to have an observable impact on groundwater quality. Changing concentrations indicate that the system is establishing a new equilibrium following source removal. Nature and Extent sampling suggests that the GWPS exceedances do not pose an immediate threat to human health or the environment. Continued monitoring at Bottom Ash Ponds 1-2 is appropriate to understand the new geochemical equilibrium being established at the former unit and determine if the formal selection of a remedy beyond source control is required.

Pond A

Additional data gathering activities will be conducted downgradient of Pond A in 2021 to support the development of the Remedial Action Plan being submitted to the State of Michigan under Consent Agreement 115-01-2018. These data collection activities will further refine the definition of the nature and extent of arsenic concentrations associated with CCR management at the JH Campbell site and inform the selection of a final remedy, if necessary, following source control at Pond A.

Remedy Selection Process

The ACM Report identified source removal and final cover as primary corrective actions for Ponds 1-2 and Pond A, respectively, but also considered five technically feasible groundwater management alternatives to address the potential for residual arsenic. Additional data collected under the state and federal groundwater monitoring programs is being used to inform remedy selection and the creation of a Remedial Action Plan under the December 2018 agreement with EGLE.

If necessary, following the source control activities, the remedy for Ponds 1-2 and Pond A will be formally selected per §257.97 once the selected option is reviewed and commented on by EGLE and a public meeting is conducted at least 30-days prior to the final selection as required under §257.96(e).

References

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