2020 Annual Groundwater Monitoring and Corrective Action Report

JH Campbell Power Plant
Pond 3 North and 3 South CCR Unit

West Olive, Michigan

January 2021

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Executive Summary

On behalf of Consumers Energy, TRC has prepared this report for the JH Campbell (JHC) Pond 3 to cover the period of January 1, 2020 to December 31, 2020 and document the status of groundwater monitoring and corrective action for 2020 in accordance with §257.90(e).

Consumers Energy first reported the potential for statistically significant increases (SSIs) for Appendix III constituents in the *Annual Groundwater Monitoring Report, JH Campbell Power Plant, Unit 3 North and 3 South 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-15012, JHC-MW-15013, JHC-MW-15015 and JHC-MW-15016;
- Calcium at JHC-MW-15015 and JHC-MW-15016;
- Sulfate at JHC-MW-15012, JHC-MW-15013, JHC-MW-15015 and JHC-MW-15016; and
- Total dissolved solids (TDS) at JHC-MW-15015 and JHC-MW-15016.

On April 25, 2018, Consumers Energy entered assessment monitoring upon determining that an Alternate Source Demonstration for the Appendix III constituents was not successful. After subsequent sampling for Appendix IV constituents, Consumers Energy compared the assessment monitoring data to the groundwater protection standards (GWPSs) to determine whether or not Appendix IV constituents are detected at statistically significant levels above the GWPSs in accordance with §257.95. The six semiannual statistical evaluations performed to date, included those in the 2020 reporting period, have showed that no Appendix IV constituents were present at statistically significant levels above the GWPSs. Therefore, Consumers Energy remains in assessment monitoring and will not seek to initiate an assessment of corrective measures pursuant to 257.95(g)(3).

Consumers Energy will continue executing the self-implementing groundwater compliance schedule in conformance with §257.90 - §257.98. The next semiannual assessment monitoring events are tentatively scheduled for the second and fourth calendar quarter of 2021.

1.0 Introduction

On April 17, 2015, the United States Environmental Protection Agency (USEPA) published the final rule for the regulation and management of Coal Combustion Residuals (CCR) under the Resource Conservation and Recovery Act (RCRA) (the CCR Rule) (USEPA, April 2015 as amended). Standards for groundwater monitoring and corrective action codified in the CCR Rule (40 CFR 257.90 – 257.98), apply to the Consumers Energy Company (Consumers Energy) Ponds 3 North and 3 South at the JH Campbell Power Plant Site (JHC Pond 3). 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 calendar year 2020 activities at the JHC Pond 3. Assessment monitoring is ongoing at Pond 3 as specified in §257.95. Data that have been collected and evaluated in 2020 are presented in this report.

1.1 Program Summary

Consumers Energy first reported the potential for statistically significant increases (SSIs) for Appendix III constituents in the *Annual Groundwater Monitoring Report, JH Campbell Power Plant, Unit 3 North and 3 South 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-15012, JHC-MW-15013, JHC-MW-15015 and JHC-MW-15016;
- Calcium at JHC-MW-15015 and JHC-MW-15016;
- Sulfate at JHC-MW-15012, JHC-MW-15013, JHC-MW-15015 and JHC-MW-15016; and
- Total dissolved solids (TDS) at JHC-MW-15015 and JHC-MW-15016.

As discussed in the *2018 Annual Groundwater Monitoring Report for the JH Campbell Power Plant Units 3 North and 3 South CCR Unit* (2018 Annual Report) (TRC, January 2019), Consumers Energy initiated an Assessment Monitoring Program for the JHC Pond 3 CCR unit 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. On April 25, 2018, Consumers Energy entered assessment monitoring upon determining that an Alternate Source Demonstration for the Appendix III constituents was not successful.

In accordance with §257.93(h)(2) and within the compliance schedule clarified by the USEPA in April 2018, the first round of semiannual assessment monitoring data was statistically evaluated against the Groundwater Protection Standards (GWPSs) as reported on January 14, 2019 and placed in the operating record in accordance with §257.105(h)(8). This comparison showed that no Appendix IV constituents were present at statistically significant levels above the GWPSs. Therefore, Consumers Energy remained in assessment monitoring. The five subsequent assessment monitoring evaluations, including those in the 2020 reporting period, have also indicated that no Appendix IV constituents have been present in downgradient monitoring wells

at statistically significant levels exceeding the GWPSs. Therefore, the Pond 3 monitoring system remained in assessment monitoring and has continued to be sampled for the Appendix III and Appendix IV constituents and statistically evaluated on a semiannual basis in accordance with §257.95. Assessment monitoring data that have been collected and evaluated in 2020 are presented in this report.

1.2 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.

Currently, there are no remaining active CCR surface impoundments at the JHC solid waste disposal facility. The CCR disposal area had contained two primary components: a system of wet ash ponds and a dry ash disposal facility (i.e., the JHC Dry Ash Landfill). The CCR surface impoundments located within the former wet ash pond area are Pond 1-2 Bottom Ash Ponds (Ponds 1-2), Pond 3 North and Pond 3 South Bottom Ash Pond (collectively Pond 3), and Pond A. All of these impoundments have been deactivated and decommissioned. The existing Dry Ash Landfill is a double-composite geomembrane lined landfill which is licensed and permitted for CCR disposal and includes two double-lined leachate and contact water retention ponds. Site features are shown on Figure 2.

Dry, moisture-conditioned CCR from the three coal fired electric generating units continues to be managed in the licensed Dry Ash Landfill which is regulated under Part 115 of the Natural Resources and Environmental Protection Act (NREPA), PA 451 of 1994, as amended, and monitored in adherence to the facility's Michigan Department of Environment, Great Lakes, and Energy (EGLE)[1]-approved *Hydrogeological Monitoring Plan (HMP) for JH Campbell Ash Storage Facility, Consumers Power Company, Solid Waste Disposal Area, Coal Ash, Type III* (September 1996).

The surface impoundments in the wet ash pond areas (Pond 3 and Ponds 1-2) were decommissioned throughout 2017 and 2018 and replaced with concrete bottom ash treatment tanks, which became operational in July 2018. In addition, Pond A has been decommissioned with final cover placed in summer 2019. Groundwater monitoring is being conducted at Pond A during the post-closure period under the *Pond A Hydrogeological Monitoring Plan, JH Campbell Power Plant, West Olive, Michigan* (March 2019; Revised July 2019) (approved August 13, 2019), as well as in accordance with the RCRA CCR Rule.

Bottom ash is currently sluiced to the concrete tanks where it is dewatered. The settled and dewatered bottom ash is beneficially reused or managed at the Dry Ash Landfill. Sluice water

[1] Effective Monday, April 22, 2019, the Michigan Department of Environmental Quality (MDEQ) became known as the Michigan Department of Environment, Great Lakes, and Energy.

decanted from the tanks flows through a permitted ditching system to the recirculation pond. Water in the recirculation pond is then discharged through a National Pollutant Discharge Elimination System (NPDES) permitted outfall and into Pigeon River.

The purpose of the dry ash disposal facility is to contain dry bottom and fly ash produced as a result of burning coal for power production. Dry ash from all of the generating units is stored in silos until it is placed into the facility or is sold and shipped off site.

This report focuses on the former Pond 3 CCR Unit.

1.3 Geology/Hydrogeology

The upgradient/background wells are located to the north-northwest of the 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 across the Dry Ash Landfill toward the Pigeon River. The subsurface materials encountered at the JH Campbell site generally consist of approximately 40 to 60 feet of poorly graded, fine-grained lacustrine sand. A laterally extensive clay-rich till is generally encountered within approximately 40 to 60 ft bgs across the site that according to deep drilling logs conducted at the JH Campbell Power Plant (just west of the CCR units) is on the order of 80 feet thick and extends to the top of shale bedrock approximately 140 ft bgs.

2.0 Groundwater Monitoring

2.1 Monitoring Well Network

In accordance with 40 CFR 257.91, Consumers Energy established a groundwater monitoring system for Pond 3, which currently consists of 12 monitoring wells (6 background monitoring wells, 4 downgradient monitoring wells, and 2 upgradient 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). Background groundwater quality data from these six background wells are additionally used for the CCR groundwater monitoring program at three other JH Campbell CCR units.

Six Background Monitoring Wells:

- JHC-MW-15023 through JHC-MW-15028

Due to the cessation of hydraulic loading and decommissioning of Pond 3, the groundwater flow direction changed significantly from the previous baseline and assessment monitoring events such that groundwater flow is generally toward the south/southwest at Pond 3. As a result, Pond 3 monitoring wells JHC-MW-15015 and JHC-MW-15016 are no longer positioned downgradient from Pond 3. In response, as documented in the 2018 Annual Report, Consumers Energy installed three new downgradient wells on December 3 through December 5, 2018 and collected additional data from these new wells to reassess groundwater flow and ensure a sufficient number of wells were appropriately located to assess groundwater quality downgradient from the Pond 3 CCR Unit. As documented in the 2019 Annual Groundwater Monitoring Report, JH Campbell Power Plant, Unit 3 North and 3 South CCR Unit (2019 Annual Report) (TRC January 2020), sampling data from 2018 and 2019 confirmed that monitoring wells JHC-MW-18001, JHC-MW-18002, and JHC-MW-18003 are appropriately positioned to assess groundwater quality downgradient from the Pond 3 CCR Unit. Therefore, JHC-MW-18001, JHC-MW-18002, and JHC-MW-18003 were added to the downgradient monitoring network, in addition to existing downgradient monitoring well JHC-MW-15013, for Pond 3.

Monitoring wells JHC-MW-15015 and JHC-MW-15016 were historically located downgradient of Pond 3 when flow was radially outward and will continue to be sampled and evaluated as part of the assessment monitoring program to evaluate groundwater quality post-CCR removal.

The Pond 3 monitoring network consists of:

Pond 3 Downgradient Monitoring Wells:

- JHC-MW-18001
- JHC-MW-18002
- JHC-MW-18003
- JHC-MW-15013

Other Pond 3 Assessment Monitoring Wells (currently located upgradient):

- JHC-MW-15015
- JHC-MW-15016

As shown on Figure 2, monitoring wells JHC-MW-15029 and JHC-MW-15030 are used for water level measurements only. Static water level data are collected at additional wells throughout the JH Campbell CCR units and used to construct a site-wide groundwater contour map. No changes to the Pond 3 monitoring well network were made in 2020.

2.2 Semiannual Groundwater Monitoring

Per §257.95(d), 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 those constituents in Appendix IV of the CCR Rule that were detected during prior sampling. In addition to the Appendix III and IV constituents, field parameters including dissolved oxygen, oxidation reduction potential, specific conductivity, temperature, and turbidity were collected at each well. Samples were collected and analyzed in accordance with the JH Campbell Monitoring Program Sample Analysis Plan (SAP) (ARCADIS, 2016).

2.2.1 Data Summary

The first semiannual groundwater assessment monitoring event for 2020 was performed on April 13 through 16, 2020 and the second semiannual groundwater assessment monitoring event for 2020 was performed on October 19 through 23, 2020. Both events were performed by Consumers Energy, and samples were analyzed by Consumers Energy Laboratory Services in Jackson, Michigan in accordance with the SAP. Static water elevation data were collected at all monitoring well locations. Groundwater samples were collected from the six background monitoring wells and six Pond 3 monitoring wells for the Appendix III and Appendix IV constituents and field parameters.

A summary of the groundwater data collected during April and October 2020 events are provided on Table 1 (static groundwater elevation data), Table 2 (field data), Table 3 (background analytical results), and Table 4 (Pond 3 analytical results).

2.2.2 Data Quality Review

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

2.2.3 Groundwater Flow Rate and Direction

Groundwater elevations measured across the Site during the April and October 2020 events are provided on Table 1. April 2020 and October 2020 groundwater elevations were used to construct the groundwater contour maps provided on Figure 3 and Figure 4, respectively. The

average hydraulic gradient 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 0.68 ft/day or 250 ft/year for the April 2020 event, and 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 Appendix IV constituents that could potentially migrate from Pond 3.

3.0 Statistical Evaluation

Assessment monitoring is continuing at the JHC Pond 3 in accordance with §257.95. The following section summarizes the statistical approach applied to assess the 2020 groundwater data in accordance with the assessment monitoring program. The statistical evaluations details are provided in Appendix B *(April 2020 Assessment Monitoring Data Summary and Statistical Evaluation)* and Appendix C *(October 2020 Assessment Monitoring Data Summary and Statistical Evaluation)*.

3.1 Establishing Groundwater Protection Standards

The Groundwater Protection Standards (GWPSs) are used to assess whether Appendix IV constituent concentrations are present in groundwater at unacceptable levels as a result of CCR Unit operations by statistically comparing concentrations in the downgradient wells to the GWPSs for each Appendix IV constituent. The calculation of the GWPSs is documented in the Groundwater Protection Standards technical memorandum included in Appendix C of the 2018 Annual Report (TRC, January 2019).

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 presented in the 2019 Annual Report, the statistical data comparison for the 2018 and 2019 semiannual assessment monitoring events indicated that no Appendix IV constituents were present at statistically significant levels exceeding the GWPSs. Therefore, assessment monitoring continued in 2020.

The statistical data comparison for the April 2020 (Appendix B) and October 2020 (Appendix C) semiannual assessment monitoring events continue to indicate that no Appendix IV constituents were present at statistically significant levels exceeding the GWPSs. Therefore, Consumers Energy has continued assessment monitoring.

Overall, the statistical assessments have confirmed that no Appendix IV constituents are present at statistically significant levels above the GWPSs. Due to the changes in groundwater flow direction subsequent to pond decommissioning, monitoring wells JHC-MW-15015 and JHC-MW-15016 are no longer downgradient of groundwater flow across the Pond 3 area. However, as discussed in Section 2.1, they will continue to be sampled and evaluated as part of the assessment monitoring program and used to evaluate groundwater quality post-CCR removal. A summary of the confidence intervals for April 2020 and October 2020 are provided in Table 5 and Table 6, respectively.

Per §257.95(e), Consumers Energy can return to detection monitoring at Pond 3 if the concentrations of all of the Appendix III and IV constituents are at or below background values for two consecutive events, using the statistical procedures included in §257.93(g). As shown

on Table 4, several Appendix III and Appendix IV constituents are above the background upper tolerance limits (UTLs). Therefore, Consumers Energy will continue semiannual assessment monitoring per §257.95(d).

4.0 Corrective Action

There were no corrective actions needed or performed for Pond 3 within the calendar year 2020. The semiannual assessment monitoring analysis completed to-date indicate that no Appendix IV constituents are present at statistically significant levels exceeding the GWPSs. Therefore, Consumers Energy has continued semiannual assessment monitoring at Pond 3 per §257.95(d) and will continue executing the self-implementing groundwater compliance schedule in conformance with §257.90 - §257.98.

5.0 Conclusions and Recommendations

Assessment monitoring groundwater samples are collected semiannually from the Pond 3 groundwater monitoring system wells and analyzed for Appendix III and Appendix IV constituents pursuant to §257.95(d). Pond 3 has been decommissioned and CCRs have been removed. The semiannual assessment monitoring analysis completed to-date indicates that no Appendix IV constituents are present at statistically significant levels exceeding the GWPSs. Therefore, Consumers Energy has continued semiannual assessment monitoring at Pond 3 and continues to evaluate groundwater quality post-CCR removal. Data that has been collected and evaluated in 2020 are presented in this report.

Per §257.95(e), Consumers Energy can return to detection monitoring at the Pond 3 if the concentrations of all of the Appendix III and IV constituents are at or below background values for two consecutive events, using the statistical procedures included in §257.93(g). Several Appendix III and Appendix IV constituents remain above the background levels. Therefore, Consumers Energy will continue semiannual assessment monitoring per §257.95(d) and will continue executing the self-implementing groundwater compliance schedule in conformance with §257.90 - §257.98.

The next semiannual monitoring events are scheduled for the second and fourth calendar quarters of 2021.

6.0 References

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USEPA. April 2015. 40 CFR Parts 257 and 261. Hazardous and Solid Waste Management System: Disposal of Coal Combustion Residuals from Electric Utilities; Final Rule. 80 Federal Register 74 (April 17, 2015), pp. 21301-21501 (80 FR 21301).

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 – April & October 2020

JH Campbell – RCRA CCR Monitoring Program

West Olive, Michigan

Well Location	Ground Surface Elevation (ft)	TOC Elevation (ft)	Geologic Unit of Screen Interval	Screen Interval Elevation (ft)			April 13, 2020		October 19, 2020	
							Depth to Water (ft BTOC)	Groundwater Elevation (ft)	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	17.70	602.28
JHC-MW-15024	613.79	616.62	Sand	606.8	to	596.8	9.92	606.70	12.49	604.13
JHC-MW-15025	614.14	617.17	Sand	607.1	to	597.1	8.93	608.24	11.40	605.77
JHC-MW-15026	615.09	618.04	Sand	607.1	to	597.1	10.61	607.43	12.90	605.14
JHC-MW-15027	614.77	617.30	Sand	604.8	to	594.8	10.87	606.43	13.13	604.17
JHC-MW-15028	611.02	613.80	Sand	603.0	to	593.0	11.51	602.29	12.75	601.05
JHC-MW-15029	608.08	610.95	Sand	600.1	to	590.1	9.60	601.35	10.57	600.38
JHC-MW-15030	604.05	607.17	Sand	600.1	to	590.1	8.22	598.95	9.17	598.00
Pond 1N, 1S, 2N, 2S										
JHC-MW-15001	607.02	609.53	Sand	603.5	to	598.5	11.41	598.12	11.78	597.75
JHC-MW-15002	618.18	621.27	Sand	590.2	to	580.2	23.88	597.39	24.61	596.66
JHC-MW-15003	623.16	627.20	Sand	595.2	to	585.2	32.35	594.85	32.94	594.26
JHC-MW-15005	606.22	609.99	Sand	579.2	to	569.2	18.01	591.98	18.27	591.72
JHC-MW-18004	602.92	605.72	Sand	596.9	to	586.9	11.33	594.39	12.17	593.55
JHC-MW-18005	600.30	603.16	Sand	595.3	to	585.3	10.18	592.98	10.69	592.47
Pond 3N, 3S										
JHC-MW-15013	632.40	635.25	Sand	604.4	to	594.4	34.28	600.97	34.98	600.27
JHC-MW-15015	632.46	635.20	Sand	604.5	to	594.5	33.44	601.76	34.13	601.07
JHC-MW-15016	631.81	632.52	Sand	603.8	to	593.8	30.70	601.82	31.46	601.06
JHC-MW-18001	609.09	611.98	Sand	603.1	to	593.1	11.04	600.94	11.71	600.27
JHC-MW-18002	605.53	608.93	Sand	602.0	to	592.0	8.37	600.56	8.88	600.05
JHC-MW-18003	605.36	608.78	Sand	601.9	to	591.9	8.30	600.48	8.86	599.92
Landfill										
JHC-MW-15017	613.69	616.61	Sand	603.7	to	593.7	13.05	603.56	14.54	602.07
JHC-MW-15018	614.26	617.02	Sand	604.3	to	594.3	13.80	603.22	15.23	601.79
JHC-MW-15019	609.81	612.86	Sand	603.8	to	593.8	10.22	602.64	11.66	601.20
JHC-MW-15022	620.92	623.79	Sand	597.9	to	587.9	27.28	596.51	28.78	595.01
JHC-MW-15031	632.94	635.87	Sand	599.9	to	589.9	41.84	594.03	42.82	593.05
JHC-MW-15032	611.32	614.29	Sand	598.3	to	588.3	15.31	598.98	17.15	597.14
JHC-MW-15033	618.08	620.99	Sand	602.1	to	592.1	19.89	601.10	22.07	598.92
JHC-MW-15034	612.90	615.97	Sand	601.9	to	591.9	13.55	602.42	15.90	600.07
JHC-MW-15035	632.53	634.28	Sand	599.5	to	589.5	39.11	595.17	40.09	594.19
JHC-MW-15036	617.94	618.34	Sand	597.9	to	587.9	25.43	592.91	26.41	591.93
JHC-MW-15037	614.28	616.06	Sand	591.3	to	586.3	23.97	592.09	24.95	591.11
Pond A										
JHC-MW-15006	624.74	627.58	Sand	599.7	to	589.7	33.65	593.93	34.98	592.60
JHC-MW-15007	624.82	627.70	Sand	602.8	to	592.8	33.95	593.75	Dry	
JHC-MW-15008	632.43	635.30	Sand	604.4	to	594.4	Decommissioned		Decommissioned	
JHC-MW-15008R[(1)]	632.32	634.67	Sand	597.3	to	587.3	41.46	593.21	42.98	591.69
JHC-MW-15009	632.33	635.32	Sand	602.3	to	592.3	41.77	593.55	Dry	
JHC-MW-15010	632.55	635.57	Sand	602.6	to	592.6	41.28	594.29	42.38	593.19
JHC-MW-15011	627.71	630.83	Sand	600.7	to	590.7	37.83	593.00	38.71	592.12
Downgradient Wells										
MW-13	593.40	595.37	Clayey Silt	587.9	to	585.4	9.59	585.78	Dry	
MW-14S	587.36	590.98	Sand	582.9	to	577.9	8.38	582.60	9.02	581.96
PZ-23S	602.84	604.97	Sand	591.8	to	586.8	14.81	590.16	15.34	589.63
PZ-24S	586.56	590.15	Sand	584.6	to	579.6	7.94	582.21	7.53	582.62
PZ-40S	589.51	593.25	Sand	585.5	to	575.5	9.86	583.39	10.91	582.34
TW-19-04A	608.15	611.44	Sand	591.2	to	586.2	20.85	590.59	22.15	589.29
TW-19-05	603.44	606.36	Sand	592.8	to	587.8	14.37	591.99	16.14	590.22
TW-19-06A	599.61	602.54	Sand	592.3	to	587.3	11.81	590.73	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: April & October 2020
JH Campbell Ponds 3N/3S - West Olive - RCRA CCR Monitoring Program
West Olive, Michigan

Sample Location	Sample Date	Dissolved Oxygen (mg/L)	Oxidation Reduction Potential (mV)	pH (SU)	Specific Conductivity (umhos/cm)	Temperature (°C)	Turbidity (NTU)
Background							
JHC-MW-15023	4/16/2020	0.81	208.9	5.4	84	8.2	0.0
	10/20/2020	0.62	225.8	5.5	74	12.1	9.4
JHC-MW-15024	4/16/2020	0.87	203.3	6.5	321	7.5	0.0
	10/20/2020	0.28	116.1	6.9	308	11.9	9.1
JHC-MW-15025	4/16/2020	4.19	193.8	6.2	215	7.2	0.0
	10/20/2020	1.42	136.7	6.6	262	12.0	9.2
JHC-MW-15026	4/16/2020	2.86	189.4	6.4	185	8.1	0.0
	10/20/2020	3.77	138.1	6.4	127	11.5	8.6
JHC-MW-15027	4/16/2020	4.13	147.2	5.6	59	7.7	2.8
	10/20/2020	1.87	94.3	6.0	81	11.0	5.7
JHC-MW-15028	4/16/2020	7.13	186.4	6.0	82	8.8	0.0
	10/20/2020	4.92	101.4	7.3	82	12.5	7.6
Ponds 3N/3S							
JHC-MW-15013	4/16/2020	0.20	-77.5	6.6	1,102	15.3	1.8
	10/22/2020	0.44	-56.5	6.7	955	15.0	7.4
JHC-MW-15015	4/16/2020	0.10	-93.6	6.7	985	13.3	2.4
	10/23/2020	0.19	-64.9	6.8	838	14.9	5.5
JHC-MW-15016	4/16/2020	0.12	-70.4	6.7	932	13.0	4.4
	10/23/2020	0.18	-48.2	6.9	736	14.8	6.9
JHC-MW-18001	4/15/2020	0.34	-1.5	8.2	698	9.0	2.1
	10/23/2020	0.37	-83.7	7.8	838	16.0	8.8
JHC-MW-18002	4/15/2020	1.39	96.8	7.3	352	8.8	2.4
	10/22/2020	0.38	14.3	7.2	235	16.8	9.6
JHC-MW-18003	4/15/2020	0.39	5.0	7.2	540	8.4	8.8
	10/22/2020	0.47	13.7	6.9	545	16.1	7.2

Notes:
mg/L - Milligrams per Liter.
mV - Millivolts.
SU - Standard Units.
umhos/cm - Micromhos per centimeter.
°C - Degrees Celcius.
NTU - Nephelmetric Turbidity Unit.

Table 3
Summary of Groundwater Sampling Results (Analytical): April & October 2020
JH Campbell Background – RCRA CCR Monitoring Program
West Olive, Michigan

						Sample Location:	JHC-MW-15023	JHC-MW-15024		JHC-MW-15025	
						Sample Date:	4/16/2020	10/20/2020	4/16/2020	10/20/2020	4/16/2020	10/20/2020
Constituent	Unit	EPA MCL	MI Residential*	MI Non-Residential*	MI GSI^							
Appendix III												
Boron	ug/L	NC	500	500	7,200		45	71	22	35	26	33
Calcium	mg/L	NC	NC	NC	500(2)		9.59	11.1	32.8	39.0	16.1	23.2
Chloride	mg/L	250**	250(1)	250(1)	500(2)		1.84	1.60	20.1	17.1	15.8	22.6
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)		9.75	10.1	6.26	8.93	8.63	9.82
Total Dissolved Solids	mg/L	500**	500(1)	500(1)	500		56	57	158	181	98	142
pH, Field	SU	**6.5 - 8.5****	**6.5 - 8.5(1)**	**6.5 - 8.5(1)**	**6.5 - 9.0**		**5.4**	**5.5**	6.5	6.9	**6.2**	6.6
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		20	21	18	20	20	11
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		< 15	< 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		< 0.165	< 0.262	< 0.222	< 0.294	< 0.280	< 0.269
Radium-228	pCi/L	NC	NC	NC	NC		< 0.634	< 0.182	< 0.717	< 0.582	< 1.90	< 0.209
Radium-226/228	pCi/L	5	NC	NC	NC		< 0.634	< 0.262	< 0.717	< 0.582	< 1.90	< 0.269
Selenium	ug/L	50	50	50	5.0		< 1	< 1	< 1	1	< 1	1
Thallium	ug/L	2	2.0	2.0	3.7		< 2	< 2	< 2	< 2	< 2	< 2

Notes:
ug/L - micrograms per liter.
mg/L - milligrams per liter.
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.
* - 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.
(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}.
BOLD value indicates an exceedance of one or more of the listed criteria.
RED value indicates an exceedance of the MCL.
All metals were analyzed as total unless otherwise specified.

Table 3
Summary of Groundwater Sampling Results (Analytical): April & October 2020
JH Campbell Background – RCRA CCR Monitoring Program
West Olive, Michigan

						Sample Location:	JHC-MW-15026		JHC-MW-15027		JHC-MW-15028	
						Sample Date:	4/16/2020	10/20/2020	4/16/2020	10/20/2020	4/16/2020	10/20/2020
Constituent	Unit	EPA MCL	MI Residential*	MI Non-Residential*	MI GSI^							
Appendix III												
Boron	ug/L	NC	500	500	7,200		< 20	25	< 20	< 20	< 20	< 20
Calcium	mg/L	NC	NC	NC	500(2)		16.6	17.1	7.78	12.9	11.1	17.4
Chloride	mg/L	250**	250(1)	250(1)	500(2)		7.21	5.33	< 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)		6.94	7.87	7.86	6.54	5.22	6.15
Total Dissolved Solids	mg/L	500**	500(1)	500(1)	500		76	75	37	49	42	68
pH, Field	SU	**6.5 - 8.5****	**6.5 - 8.5(1)**	**6.5 - 8.5(1)**	**6.5 - 9.0**		**6.4**	**6.4**	**5.6**	**6.0**	**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		15	14	25	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		< 15	< 6	< 6	< 6	< 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		< 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		< 0.139	< 0.264	< 0.184	< 0.368	< 0.262	< 0.258
Radium-228	pCi/L	NC	NC	NC	NC		< 0.676	< 0.364	< 1.37	< 0.411	< 0.651	0.346
Radium-226/228	pCi/L	5	NC	NC	NC		< 0.676	< 0.364	< 1.37	< 0.411	< 0.651	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

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.
* - 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.
(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}.
BOLD value indicates an exceedance of one or more of the listed criteria.
RED value indicates an exceedance of the MCL.
All metals were analyzed as total unless otherwise specified.

Table 4
Summary of Groundwater Sampling Results (Analytical): April & October 2020
JH Campbell Ponds 3N/3S – RCRA CCR Monitoring Program
West Olive, Michigan

							Sample Location:	JHC-MW-15013	JHC-MW-15015[3]		JHC-MW-15016[3]	
							Sample Date:	4/16/2020	10/22/2020	4/16/2020	10/23/2020	4/16/2020	10/23/2020
Constituent	Unit	UTL	EPA MCL	MI Residential*	MI Non-Residential*	MI GSI^							
Appendix III													
Boron	ug/L	51	NC	**500**	**500**	7,200		55	279	**1,400**	**1,770**	**5,060**	**6,390**
Calcium	mg/L	46	NC	NC	500[2]	500		146	143	162	142	134	95.9
Chloride	mg/L	43	250**	250[1]	500[2]	500		9.48	11.7	11.0	7.21	8.76	5.88
Fluoride	ug/L	1,000	4,000	NC	NC	NC		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	14	**250****	**250[1]**	500[2]	500		**276**	205	56.6	36.6	18.2	15.8
Total Dissolved Solids	mg/L	258	**500****	**500[1]**	**500**	**500**		**741**	**659**	**597**	**510**	**526**	405
pH, Field	SU	4.8 - 9.2	6.5 - 8.5**	6.5 - 8.5[1]	6.5 - 8.5[1]	6.5 - 9.0		6.6	6.7	6.7	6.8	6.7	6.9
Appendix IV													
Antimony	ug/L	2	6	6.0	6.0	130		< 1	< 1	< 1	< 1	< 1	< 1
Arsenic	ug/L	1	10	10	10	10		< 1	< 1	< 1	< 1	2	1
Barium	ug/L	35	2,000	2,000	2,000	820		73	66	67	53	100	100
Beryllium	ug/L	1	4	4.0	4.0	18		< 1	< 1	< 1	< 1	< 1	< 1
Cadmium	ug/L	0.2	5	5.0	5.0	3.5		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium	ug/L	2	100	100	100	11		< 1	1	< 1	< 1	< 1	1
Cobalt	ug/L	15	NC	40	100	100		< 15	< 15	< 15	< 15	< 15	< 15
Fluoride	ug/L	1,000	4,000	NC	NC	NC		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	1	NC	4.0	4.0	39		< 1	< 1	< 1	< 1	< 1	< 1
Lithium	ug/L	10	NC	170	350	440		< 10	< 10	< 10	< 10	< 10	< 10
Mercury	ug/L	0.2	2	2.0	2.0	0.20#		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Molybdenum	ug/L	5	NC	**73**	210	3,200		6	7	52	27	59	**75**
Radium-226	pCi/L	NA	NC	NC	NC	NC		0.222	< 0.368	< 0.125	< 0.428	0.274	< 0.355
Radium-228	pCi/L	NA	NC	NC	NC	NC		< 0.580	< 0.398	< 0.577	< 0.361	< 0.751	< 0.453
Radium-226/228	pCi/L	1.93	5	NC	NC	NC		0.729	0.603	< 0.577	< 0.428	< 0.751	0.506
Selenium	ug/L	5	**50**	**50**	**50**	**5.0**		< 1	< 1	< 1	< 1	< 1	< 1
Thallium	ug/L	2	2	2.0	2.0	3.7		< 2	< 2	< 2	< 2	< 2	< 2

Notes:

ug/L - micrograms per liter.
mg/L - milligrams per liter.
SU - standard units; pH is a field parameter.
pCi/L - picocuries per liter.
UTL - Upper Tolerance Limit of the background data set. Appendix III UTLs established in TRC's technical memorandum dated January 15, 2018. Appendix IV UTLs established in TRC's technical memorandum dated October 15, 2018.
MCL - Maximum Contaminant Level, EPA Drinking Water Standards and Health Advisories, April 2012.
NA - not applicable.
NC - no criteria.
* - 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.
(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) - Monitoring wells JHC-MW-15015 and JHC-MW-15016 have been upgradient of Pond 3 since 2018 due to post-pond decommissioning groundwater flow direction changes. These wells are no longer considered downgradient monitoring wells.
Indicates that the concentration in one or more wells exceeds the background level. If concentrations of all Appendix III and Appendix IV constituents are below the background level for two consecutive events, the unit may return to detection monitoring.
BOLD value indicates an exceedance of one or more of the listed criteria.
RED value indicates an exceedance of the MCL.
All metals were analyzed as total unless otherwise specified.

Table 4
Summary of Groundwater Sampling Results (Analytical): April & October 2020
JH Campbell Ponds 3N/3S – RCRA CCR Monitoring Program
West Olive, Michigan

							JHC-MW-18001		JHC-MW-18002		JHC-MW-18003	
						Sample Location:						
						Sample Date:	4/15/2020	10/23/2020	4/15/2020	10/22/2020	4/15/2020	10/22/2020
Constituent	Unit	UTL	EPA MCL	MI Residential*	MI Non-Residential*	MI GSI^						
Appendix III												
Boron	ug/L	51	NC	**500**	**500**	7,200	376	476	273	272	283	310
Calcium	mg/L	46	NC	NC	500(2)	500	71.7	74.8	45.9	32.6	78.5	75.1
Chloride	mg/L	43	250**	250(1)	500(2)	500	5.01	9.24	3.32	< 1.00	11.7	3.18
Fluoride	ug/L	1,000	4,000	NC	NC	NC	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	14	**250****	**250(1)**	500(2)	500	94.1	174	45.9	11.8	88.9	74.5
Total Dissolved Solids	mg/L	258	**500****	**500(1)**	**500**	**500**	418	**528**	230	140	352	324
pH, Field	SU	4.8 - 9.2	6.5 - 8.5**	6.5 - 8.5(1)	6.5 - 8.5(1)	6.5 - 9.0	8.2	7.8	7.3	7.2	7.2	6.9
Appendix IV												
Antimony	ug/L	2	6	6.0	6.0	130	< 1	< 1	< 1	1	< 1	< 1
Arsenic	ug/L	1	10	10	10	10	2	2	< 1	< 1	< 1	< 1
Barium	ug/L	35	2,000	2,000	2,000	820	529	659	108	53	97	92
Beryllium	ug/L	1	4	4.0	4.0	18	< 1	< 1	< 1	< 1	< 1	< 1
Cadmium	ug/L	0.2	5	5.0	5.0	3.5	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium	ug/L	2	100	100	100	11	< 1	1	< 1	1	< 1	1
Cobalt	ug/L	15	NC	40	100	100	< 15	< 15	< 15	< 15	< 15	< 15
Fluoride	ug/L	1,000	4,000	NC	NC	NC	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	1	NC	4.0	4.0	39	< 1	< 1	< 1	< 1	< 1	< 1
Lithium	ug/L	10	NC	170	350	440	< 10	< 10	< 10	< 10	< 10	< 10
Mercury	ug/L	0.2	2	2.0	2.0	0.20#	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Molybdenum	ug/L	5	NC	**73**	210	3,200	18	17	15	20	19	18
Radium-226	pCi/L	NA	NC	NC	NC	NC	0.284	0.464	< 0.105	< 0.323	< 0.118	< 0.276
Radium-228	pCi/L	NA	NC	NC	NC	NC	< 0.355	< 0.408	< 0.415	< 0.501	< 0.465	0.405
Radium-226/228	pCi/L	1.93	5	NC	NC	NC	0.463	0.621	< 0.415	< 0.501	< 0.465	0.557
Selenium	ug/L	5	**50**	**50**	**50**	**5.0**	**27**	**7**	**57**	**12**	4	1
Thallium	ug/L	2	2	2.0	2.0	3.7	< 2	< 2	< 2	< 2	< 2	< 2

Notes:

ug/L - micrograms per liter.
mg/L - milligrams per liter.
SU - standard units; pH is a field parameter.
pCi/L - picocuries per liter.
UTL - Upper Tolerance Limit of the background data set. Appendix III UTLs established in TRC's technical memorandum dated January 15, 2018. Appendix IV UTLs established in TRC's technical memorandum dated October 15, 2018.
MCL - Maximum Contaminant Level, EPA Drinking Water Standards and Health Advisories, April 2012.
NA - not applicable.
NC - no criteria.
* - 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.
(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) - Monitoring wells JHC-MW-15015 and JHC-MW-15016 have been upgradient of Pond 3 since 2018 due to post-pond decommissioning groundwater flow direction changes. These wells are no longer considered downgradient monitoring wells.
Indicates that the concentration in one or more wells exceeds the background level. If concentrations of all Appendix III and Appendix IV constituents are below the background level for two consecutive events, the unit may return to detection monitoring.
BOLD value indicates an exceedance of one or more of the listed criteria.
RED value indicates an exceedance of the MCL.
All metals were analyzed as total unless otherwise specified.

Table 5

Summary of Groundwater Protection Standard Exceedances – April 2020

JH Campbell Pond 3N/3S – RCRA CCR Monitoring Program

West Olive, Michigan

Constituent	Units	GWPS	JHC-MW-15015[(1)] (Upgradient)		JHC-MW-15016[(1)] (Upgradient)		JHC-MW-18002 (Downgradient)	
			LCL	UCL	LCL	UCL	LCL	UCL
Molybdenum	ug/L	100	1.7	140	26	100	--	--
Selenium	ug/L	50	--	--	--	--	16	49

Notes:

ug/L - micrograms per Liter.

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

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

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

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

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

(1) - Monitoring wells JHC-MW-15015 and JHC-MW-15016 have been upgradient of Pond 3 since 2018 due to post-pond decommissioning groundwater flow direction changes. These wells are no longer considered downgradient monitoring wells.

Table 6

Summary of Groundwater Protection Standard Exceedances – October 2020

JH Campbell Pond 3N/3S – RCRA CCR Monitoring Program

West Olive, Michigan

Constituent	Units	GWPS	JHC-MW-15015[(1)] (Upgradient)		JHC-MW-15016[(1)] (Upgradient)		JHC-MW-18002 (Downgradient)	
			LCL	UCL	LCL	UCL	LCL	UCL
Molybdenum	ug/L	100	4.7	140	35	100	--	--
Selenium	ug/L	50	--	--	--	--	11	45

Notes:

ug/L - micrograms per Liter.

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

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

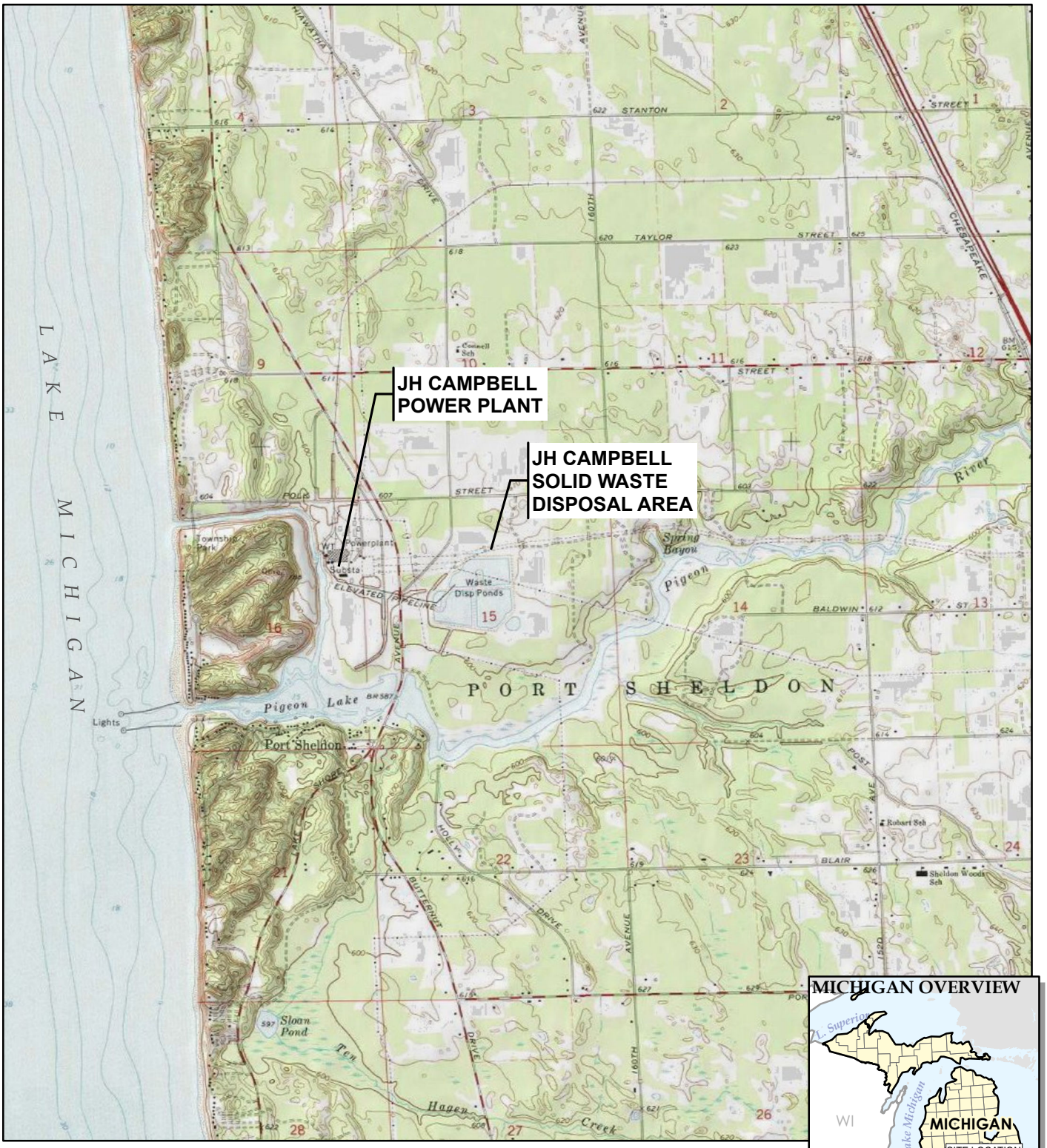
UCL - Upper Confidence Limit (α = 0.01) of the downgradient data set.

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

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

(1) - Monitoring wells JHC-MW-15015 and JHC-MW-15016 have been upgradient of Pond 3 since 2018 due to post-pond decommissioning groundwater flow direction changes. These wells are no longer considered downgradient monitoring wells.

Figures



BASE MAP FROM USGS 7.5 MINUTE TOPOGRAPHIC QUADRANGLE SERIES.

N

1 " = 3,000 '
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FEET

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PROJECT:

CONSUMERS ENERGY COMPANY
JH CAMPBELL POWER PLANT
WEST OLIVE, MICHIGAN

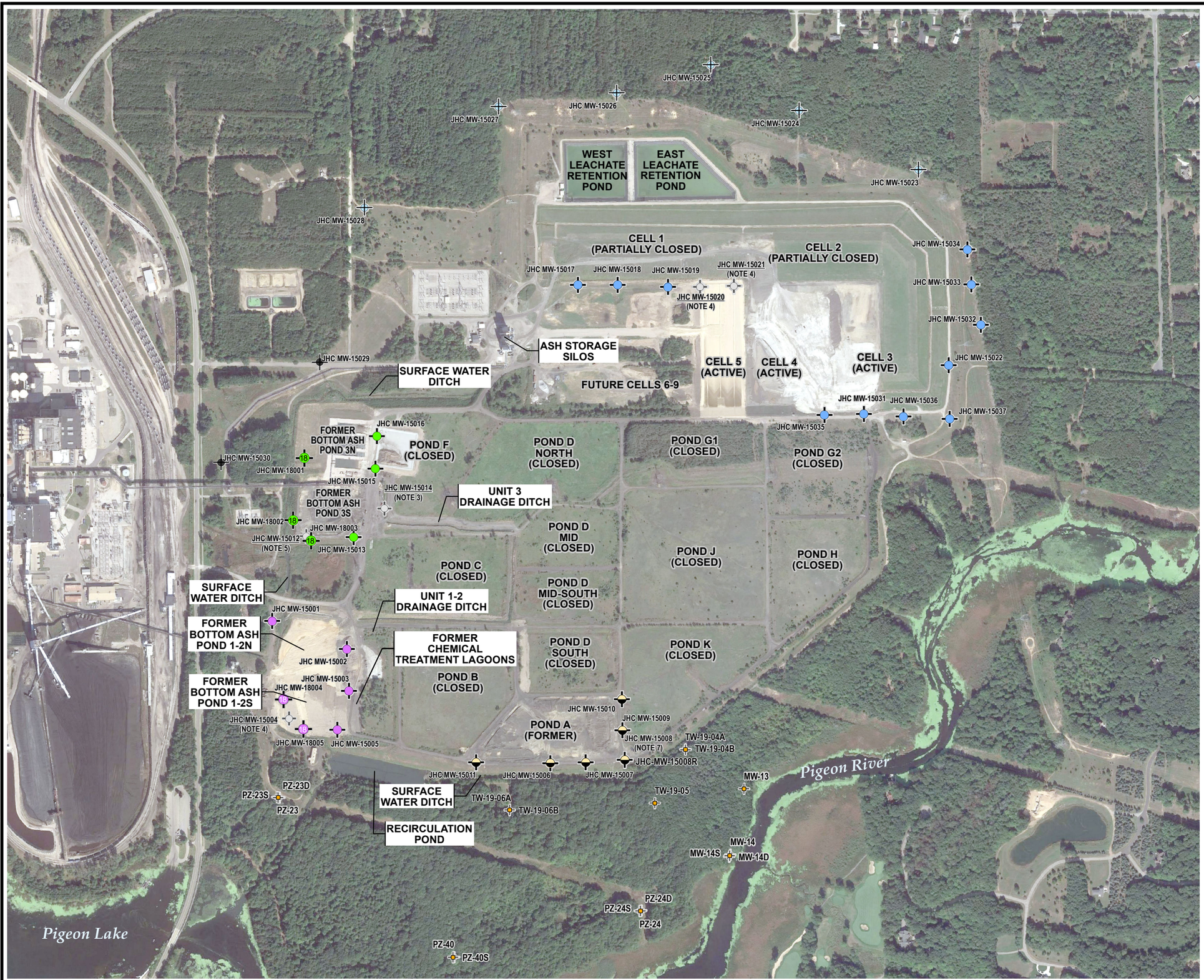
TITLE:

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

S:\1-PROJECTS\Consumers_Energy_Company\Michigan\CCR_GW\2017_269767\367390-001-007.mxd -- Saved By: SMAJOR on 1/13/2021, 09:37:27 AM



LEGEND

- BACKGROUND MONITORING WELL
- BOTTOM ASH POND 1/2 N/S MONITORING WELL
- BOTTOM ASH POND 3 N/S MONITORING WELL
- DOWNGRADIENT LANDFILL MONITORING WELL
- DOWNGRADIENT POND A MONITORING WELL
- MONITORING WELL (STATIC WATER LEVEL ONLY)
- DECOMMISSIONED MONITORING WELL
- NEW DOWNGRADIENT BOTTOM ASH POND 1/2 N/S MONITORING WELL (2018)
- NEW DOWNGRADIENT BOTTOM ASH POND 3 N/S MONITORING WELL (2018)
- NATURE AND EXTENT WELL

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.

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1 " = 700 '

1:8,400

PROJECT:

CONSUMERS ENERGY COMPANY
JH CAMPBELL POWER PLANT
WEST OLIVE, MICHIGAN

TITLE:

SITE PLAN WITH CCR MONITORING WELL LOCATIONS

DRAWN BY:	S. MAJOR	PROJ NO.:	367390.0000.0000
CHECKED BY:	B. YELEN		
APPROVED BY:	S. HOLMSTROM		**FIGURE 2**
DATE:	JANUARY 2021		

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FILE NO.: 367390-001-002.mxd

Plot Date: 1/28/2021, 09:49:40 AM by SMAJOR -- LAYOUT: ANSI B (11"x17")
Path: S:\1-PROJECTS\Consumers_Energy_Company\Michigan\CCR_GW\2017_2697\367390-001_Map Rotation: 0
Coordinate System: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl (Foot)

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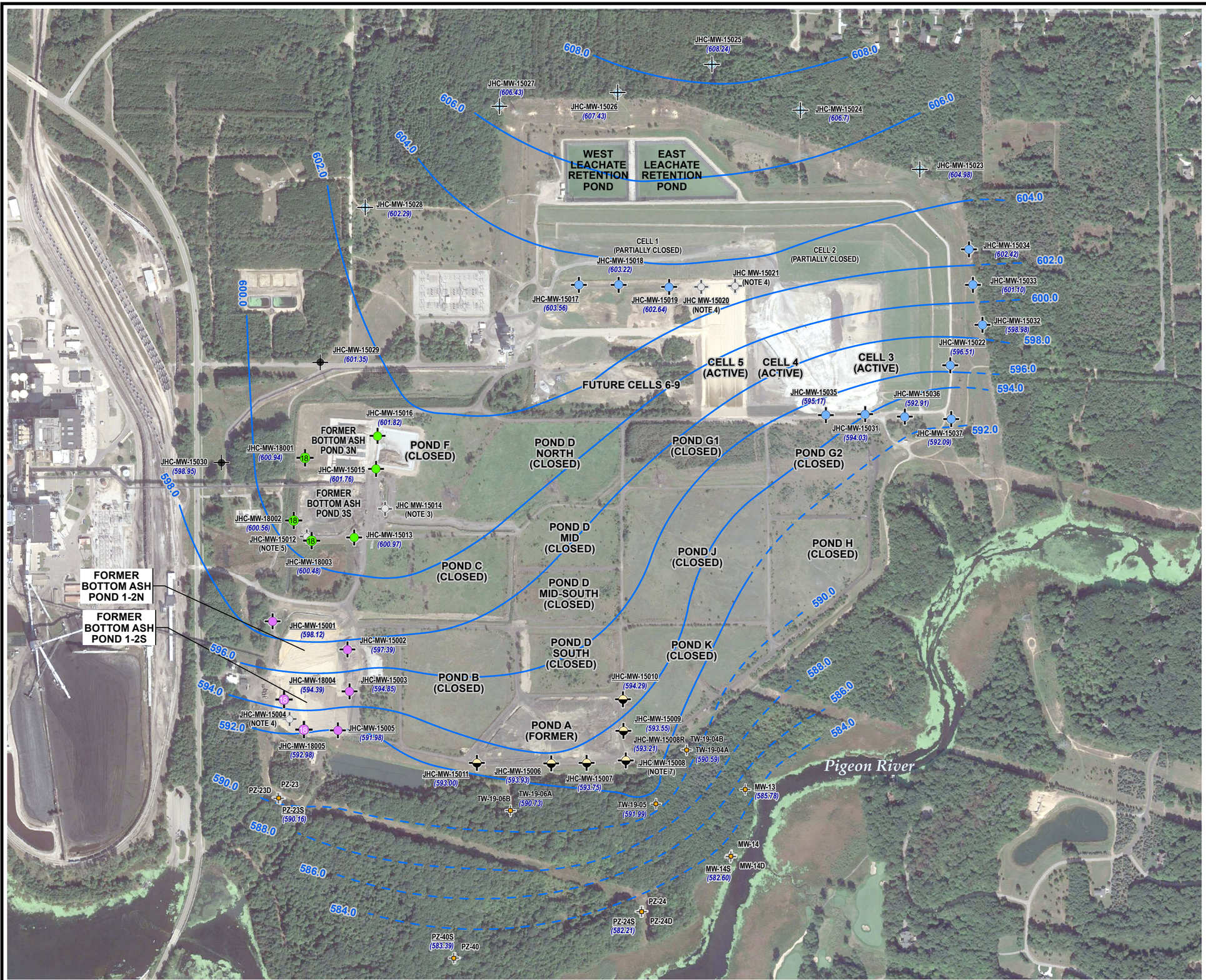

LEGEND

- BACKGROUND MONITORING WELL
- BOTTOM ASH POND 1/2 N/S MONITORING WELL
- BOTTOM ASH POND 3 N/S MONITORING WELL
- DOWNGRADIENT LANDFILL MONITORING WELL
- DOWNGRADIENT POND A MONITORING WELL
- MONITORING WELL (STATIC WATER LEVEL ONLY)
- DECOMMISSIONED MONITORING WELL
- NEW DOWNGRADIENT BOTTOM ASH POND 1/2 N/S MONITORING WELL (2018)
- NEW DOWNGRADIENT 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.

N

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1 " = 700 '

1:8,400

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

TITLE:
GROUNDWATER CONTOUR MAP APRIL 2020

DRAWN BY:	S. MAJOR	PROJ NO.:	367390.0000
CHECKED BY:	K. LOWERY		
APPROVED BY:	S. HOLMSTROM		
DATE:	JANUARY 2021		

FIGURE 3

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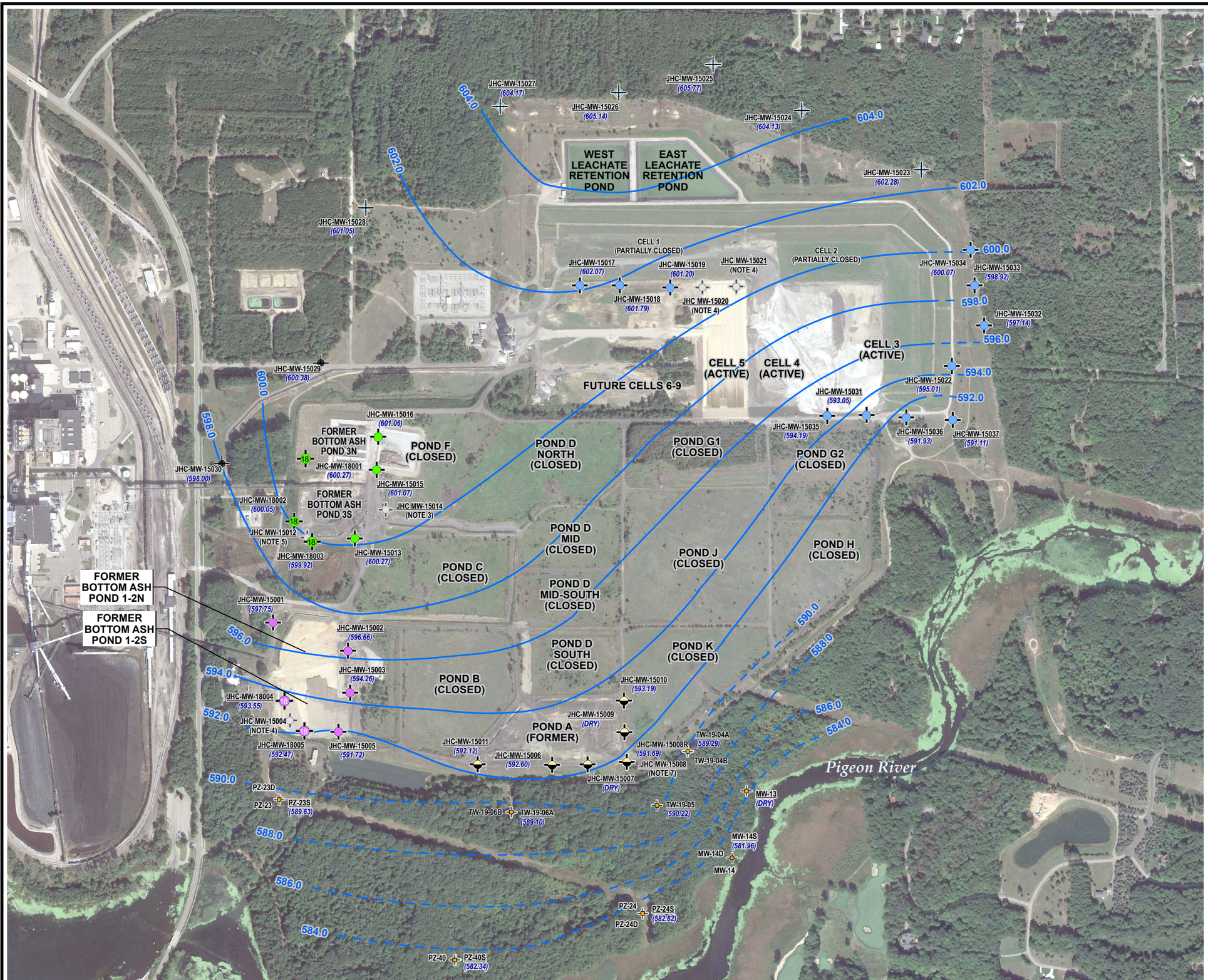
FILE NO.: 367390-001-003.mxd

Plot Date: 1/28/2021, 09:58:14 AM by SMAJOR -- LAYOUT: ANSI B (11"x17")
Path: S:\1-PROJECTS\Consumers_Energy_Company\Michigan\CCR_GW\2017_269767\367390-001\Maps\
Coordinate System: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl (Foot)
Map Rotation: 0

TRC - GIS



LEGEND

- BACKGROUND MONITORING WELL
- BOTTOM ASH POND 1/2 N/S MONITORING WELL
- BOTTOM ASH POND 3 N/S MONITORING WELL
- DOWNGRADIENT LANDFILL MONITORING WELL
- DOWNGRADIENT POND A MONITORING WELL
- MONITORING WELL (STATIC WATER LEVEL ONLY)
- DECOMMISSIONED MONITORING WELL
- NEW DOWNGRADIENT BOTTOM ASH POND 1/2 N/S MONITORING WELL (2018)
- NEW DOWNGRADIENT 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.

N

0 700 1,400 Feet

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		
APPROVED BY:	S. HOLMSTROM		**FIGURE 4**
DATE:	JANUARY 2021		

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FILE NO.: 367390-001-006.mxd

Plot Date: 1/28/2021, 10:09:35 AM by SMAJOR -- LAYOUT: ANSI B (11"x17")
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Coordinate System: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl (Foot)
Map Rotation: 0

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Appendix A
Data Quality Reviews

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
Consumers Energy JH Campbell Pond 3

Groundwater samples were collected by Consumers Energy (CE) Laboratory Services for the April 2020 sampling event. Samples were analyzed for select total metals, anions, and total dissolved solids by CE Laboratory Services in Jackson, Michigan. The laboratory analytical results were reported in laboratory project number 20-0398.

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

- JHC-MW-15013
- JHC-MW-15015
- JHC-MW-15016
- JHC-MW-18001
- JHC-MW-18002
- JHC-MW-18003

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

Note that results for an extended list of metals (iron, magnesium, potassium, and sodium), ammonia, nitrate, nitrite, alkalinity, and sulfide were provided for samples JHC-MW-15013 and JHC-MW-15015 as supplemental monitoring 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.

- Appendix III and 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

- 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 of the cooler temperatures was 8.0 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 event should be considered estimated and may be biased low as summarized in the attached table. However, TDS and anion results were within or above the range of historical concentrations. Data were deemed usable for the intended purpose.
- One equipment blank (EB-04) was collected. Target analytes were not detected.
- A field blank was not collected. Per the sampling and analysis plan (SAP), field blanks should be collected at a frequency of one field blank per 20 groundwater samples.

- MS and MSD analyses were not performed on a sample from this data set. Per the SAP, MS/MSD samples should be collected at a frequency of one per 20 groundwater samples.
- The field duplicate pair samples were DUP-04/JHC-MW-15015. 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.
- The nondetect RL for TDS (10 mg/L) in sample EB-04 is higher than the SAP RL of 1 mg/L. The RL is consistent with the Michigan Department of Environment, Great Lakes, and Energy (EGLE) Op Memo WMRPD-115-14; therefore, data usability is not affected.

Attachment A

Summary of Data Non-Conformances for Landfill Groundwater Analytical Data
JH Campbell Pond 3 – RCRA CCR Monitoring Program
West Olive, Michigan

Samples	Collection Date	Analyte	Non-Conformance/Issue
JHC-MW-15013	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 are consistent with historical results; therefore, data usability is not affected.
JHC-MW-15015	4/16/2020		
JHC-MW-15016	4/16/2020		
JHC-MW-18001	4/15/2020		
JHC-MW-18002	4/15/2020		
JHC-MW-18003	4/15/2020		
EB-04	4/16/2020		
DUP-04	4/16/2020		

Laboratory Data Quality Review
Groundwater Monitoring Event April 2020 – Radium
Consumers Energy JH Campbell Pond 3

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 160-37914-1.

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

- JHC-MW-15013
- JHC-MW-15015
- JHC-MW-15016
- JHC-MW-18001
- JHC-MW-18002
- JHC-MW-18003

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 with the following exception. Normalized absolute difference comparisons between the blank and sample that are between 1.96 and 2.58 may indicate biased high results and normalized absolute differences <1.96 may indicate a false positive sample result.
  - Radium-228 was detected in method blank 160-469860/21-A at 0.7796 +/- 0.428 pCi/L. The detected radium-228 result for sample DUP-04 associated with this method blank was potentially impacted, as summarized in the attached table, Attachment A. However, the result for DUP-04 was consistent with the parent sample (JHC_MW-15015) and with historical results; therefore, data usability is not affected.
- One equipment blank (EB-04) was collected. Target analytes were not detected.
- The LCS and 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-04/JHC-MW-15015; all criteria were met.
- 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.

Attachment A

Summary of Data Non-Conformances for Landfill Groundwater Analytical Data
JH Campbell Pond 3 – RCRA CCR Monitoring Program
West Olive, Michigan

Samples	Collection Date	Analyte	Non-Conformance/Issue
DUP-04	4/16/2020	Radium 228	Detection in method blank. Normalized absolute difference between blank and sample <1.96; indicates possible false positive result. However, the result is consistent with the parent sample result and historical results; therefore, data usability is not affected.

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		
FB-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
Consumers Energy JH Campbell Pond 3

Groundwater samples were collected by Consumers Energy Laboratory Services for the October 2020 sampling event. Samples were analyzed for select total metals, anions, and total dissolved solids by Consumers Energy 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 sample delivery groups (SDGs) 20-1194R and 160-40224-1.

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

- JHC-MW-15013
- JHC-MW-15015
- JHC-MW-15016
- JHC-MW-18001
- JHC-MW-18002
- JHC-MW-18003

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/ 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 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. 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.

- Appendix III and 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

- Method blanks were analyzed for the radium analyses. Target analytes were not detected in the method blanks with the following exception.
  - Radium 228 was detected in MB 160-490784/23-A at 0.5069 +/- 0.266 piC/L; the detection of radium 228 in sample JHC-MW-18003 is potentially a false positive as summarized in the attached table, Attachment A.
- One equipment blank (EB-03) and one field blank (FB-03) were collected. Target analytes were not detected in these blank samples.

- The LCS and LCSD recoveries and relative percent differences (RPDs) for radium were within QC limits with the following exceptions.
  - The recovery of radium 228 (132%) in LCS 160-490784/1-A was above the acceptance limits (75-125%). In addition, the relative error ratio (RER) for radium 228 (1.02) in the LCS/LCSD from the same batch was above the acceptance criteria (1.0); therefore, the positive result for radium 228 in sample JHC-MW-18003 is potentially uncertain as summarized in the attached table, Attachment A.
- MS and MSD analyses were performed on sample JHC-MW-15016 for total metals and anions. RPDs were not provided by the laboratory and therefore were not evaluated; further, MS/MSD concentrations were not provided by the laboratory. All recoveries were within the acceptance limits and there is no impact on data usability due to this issue with the following exception:
  - The percent recovery for calcium in the MSD (126%) exceeded the acceptance limit. Potential high bias exists for positive results for calcium in all groundwater samples in this data set as noted in the attached table, Attachment A. However, results are consistent with historical results; therefore, data usability is not affected.
- The field duplicate pair samples were DUP-03/JHC-MW-15013. All criteria were met.
- Carrier recoveries, where applicable, were within 40-110%.
- 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 3 – RCRA CCR Monitoring Program
West Olive, Michigan

Samples	Collection Date	Analyte	Non-Conformance/Issue
JHC-MW-15013	10/22/2020	TDS	Pre-weighed sample bag weights were potentially inaccurate. Indicates uncertainty in results.
JHC-MW-15015	10/23/2020		
JHC-MW-15016	10/23/2020		
JHC-MW-18001	10/23/2020		
JHC-MW-18002	10/22/2020		
JHC-MW-18003	10/22/2020		
DUP-03	10/22/2020		
FB-03	10/23/2020		
EB-03	10/23/2020		
JHC-MW-18003	10/22/2020	Radium 228	Analyte detected in method blank; potential false positive result.
JHC-MW-18003	10/22/2020	Radium 228	Laboratory Control Sample (LCS) percent recovery (%R) above acceptance limit (75-125%) and LCS/LCS Duplicate relative error ratio (RER) above acceptance limit (1.0); potential uncertainty exists.
JHC-MW-15013	10/22/2020	Calcium	Matrix Spike Duplicate (MSD) %R above acceptance limit (75-125%); results are potentially biased high. However, results are consistent with historical results; therefore, data usability is not affected.
JHC-MW-15015	10/23/2020		
JHC-MW-15016	10/23/2020		
JHC-MW-18001	10/23/2020		
JHC-MW-18002	10/22/2020		
JHC-MW-18003	10/22/2020		
DUP-03	10/22/2020		

Appendix B
April 2020 Assessment Monitoring Statistical Evaluation

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Technical Memorandum

Date:	July 31, 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 Bottom Ash Pond 3 North and 3 South CCR Unit, Consumers Energy Company, West Olive, Michigan

During the statistical evaluation of the initial assessment monitoring event, no Appendix IV constituents were present at statistically significant levels exceeding the Groundwater Protections Standards (GWPSs). Therefore, Consumers Energy Company (Consumers Energy) is continuing semiannual assessment monitoring in accordance with §257.95 of the CCR Rule[1] at the JH Campbell Power Plant (JHC) Bottom Ash Pond 3 North and 3 South (Pond 3). The first semiannual assessment monitoring event for 2020 was conducted on April 13 through 16, 2020. In accordance with §257.95, the assessment monitoring data must be compared to GWPSs to determine whether or not Appendix IV constituents are detected at statistically significant levels above the GWPSs. GWPSs were established in accordance with §257.95(h), as described in the October 15, 2018 Groundwater Protection Standards technical memorandum, which was also included in the 2018 Annual Groundwater Monitoring Report (2018 Annual Report) (TRC, January 2019). The following narrative describes the methods that were employed for comparisons to the GWPSs. The results obtained and the Sanitas™ output files are included as an attachment.

The statistical evaluation of the first semiannual assessment monitoring event data for 2020 indicates that no constituents are present at statistically significant levels exceeding the GWPSs in downgradient monitoring wells at the JHC Pond 3 CCR unit. This result is consistent with the results of previous assessment monitoring data statistical evaluations and concentrations remain above background levels. Consumers Energy will continue semiannual assessment monitoring per §257.95 and execute the self-implementing groundwater compliance schedule in conformance with §257.90 - §257.98.

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

Assessment Monitoring Statistical Evaluation

The compliance well network at the JHC Pond 3 CCR Unit consists of six monitoring wells. JHC-MW-15013, JHC-MW-15015, and JHC-MW-15016 are located on the eastern perimeter of the bottom ash ponds. Former downgradient monitoring well JHC-MW-15012 was decommissioned on October 10, 2018 during deconstruction of Bottom Ash Pond Unit 3 South; therefore, statistical analysis for JHC-MW-15012 terminates at the June 2018 monitoring event. Due to the cessation of hydraulic loading to Ponds 1-2 and Pond 3, the groundwater flow direction changed significantly from the previous baseline and assessment monitoring events. In response, as documented in the 2018 Annual Report, Consumers Energy installed three new downgradient wells (JHC-MW-18001 through JHC-MW-18003) on the west and southwest edge of former Pond 3 from December 3 through December 5, 2018 to reassess groundwater flow and ensure sufficient wells are appropriately located to assess groundwater quality downgradient from the Pond 3 CCR Unit. These wells were sampled quarterly for Appendix III and Appendix IV constituents from December 2018 through October 2019 (5 quarterly events) in addition to the April 2020 semiannual assessment monitoring event. These data confirm that the monitoring wells are appropriately positioned to assess groundwater quality downgradient from Pond 3. Therefore, JHC-MW-18001 through JHC-MW-18003 have been added to the downgradient monitoring network for Pond 3 and are included in this statistical evaluation.

Following the first semiannual assessment monitoring event for 2020, compliance well data for the JHC Pond 3 were evaluated in accordance with the Groundwater Statistical Evaluation Plan (Stats Plan) (TRC, October 2017). 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 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 Guidance 2, 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.

The concentrations observed in the downgradient wells are deemed to be a statistically significant exceedance when the 99 percent lower confidence limit of the downgradient data exceeds the GWPS. If the confidence interval straddles the GWPS (i.e. the lower confidence level is below the GWPS but the upper confidence level is above), the statistical test result indicates that there is insufficient confidence that the measured concentrations are different from the GWPS and thus there is no compelling evidence that the measured concentration is a result of a release from the CCR unit versus the inherent variability of the sample data. This statistical approach is consistent with the statistical methods for assessment monitoring presented in §257.93(f) and (g). Statistical evaluation methodologies built into the CCR Rule, and numerous other federal rules, are key in determining

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

whether or not individually measured data points represent a concentration increase over the baseline or a fixed standard (such as a GWPS in an assessment monitoring program).

For each detected Appendix IV constituent, the concentrations for each well were first compared directly to the GWPS, as shown on Table B1. Constituent-well combinations with a direct exceedance of the GWPS within the past 8 events (August 2017 through April 2020) for JHC-MW-15013, JHC-MW-15015, and JHC-MW-15016 and the past six events (December 2018 through April 2020) for JHC-MW-18001 through JHC-MW-18003 were retained for further analysis. Molybdenum in JHC-MW-15015 and JHC-MW-15016 and selenium in JHC-MW-18002 at JHC Pond 3 had individual results exceeding the GWPS within the subject sampling events. The only direct exceedance of a GWPS during the first semiannual assessment monitoring event for 2020 was selenium in JHC-MW-18002.

A significant change in groundwater flow conditions has been observed in the vicinity of monitoring well JHC-MW-15016, located east of the northern portion of JHC Pond 3. The groundwater flow direction changed from radially outward to predominantly southwest across the northern portion of JHC Pond 3 as a result of the following activities:

- the cessation of hydraulic loading and removal of CCR at the Pond 3 North Bottom Ash Pond (April through June 2017);
- temporary cessation of hydraulic loading in the JHC Pond 3 South Bottom Ash Pond between March 14 and April 26, 2018; and
- construction of the concrete pad over the former Pond 3 North Bottom Ash Pond (May through July 2018).

Because of the changes in site conditions and groundwater flow direction, monitoring well JHC-MW-15016 is no longer positioned downgradient from the Pond Unit 3. During the timeframe between the last background monitoring event in August 2017 and the initial assessment monitoring event in April 2018, an increase in the molybdenum concentrations in groundwater collected from monitoring well JHC-MW-15016 was observed. A direct exceedance of the GWPS for molybdenum occurred in JHC-MW-15016 in April 2018, while the concentration in groundwater at that well equaled the GWPS in July 2018. The concentration of molybdenum in JHC-MW-15016 has since diminished below the GWPS. Considering that JHC-MW-15016 was hydraulically upgradient from JHC Pond 3 and CCR had been removed from Pond 3 North Bottom Ash Pond at the time of the assessment monitoring sampling events in April and July 2018 when the molybdenum GWPS was exceeded, it is likely that the groundwater quality measured at monitoring well JHC-MW-15016 during those events is more representative of groundwater flowing toward the CCR unit from the northeast, prior to being influenced by the Pond 3 CCR unit.

Similarly, JHC-MW-15015 was hydraulically upgradient of Pond 3 at the time of the assessment monitoring sampling events in February 2019 through April 2020. Direct exceedances of the GWPS for molybdenum occurred in JHC-MW-15015 from February 2019 through October 2019. The concentration of molybdenum in JHC-MW-15015 diminished below the GWPS during the April 2020 sampling event. As such, the molybdenum groundwater data is considered suspect for the purposes of assessing groundwater quality influenced by the Pond 3 CCR unit.

CCR removal activities in the southern portion of JHC Pond 3 were completed in October 2018, so groundwater conditions were re-equilibrating at the time of the assessment monitoring sampling events during which the molybdenum concentration in JHC-MW-15015 and JHC-MW-15016 exceeded its GWPS by direct comparison. The groundwater monitoring system is being re-assessed to account for post-deconstruction groundwater conditions. However, the suspect molybdenum data have been retained in the assessment monitoring data set for this assessment monitoring data evaluation in order to remain conservative while hydrogeological conditions are stabilizing and to continue to monitor data quality at those locations post-CCR removal.

Groundwater data for the monitoring wells with individual results exceeding a GWPS by direct comparison were evaluated utilizing Sanitas™ statistical software. Sanitas™ is a software tool that is commercially available for performing statistical evaluation consistent with procedures outlined in the Unified Guidance. Within the Sanitas™ statistical program, confidence limits were selected to perform the statistical comparison of compliance data to a fixed standard. Parametric confidence intervals were calculated (for each of the three CCR Appendix IV data sets with a direct exceedance of a GWPS using a 99 percent confidence level, 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 (August 2017) results and assessment monitoring results (April 2018 through April 2020) for molybdenum in JHC-MW-15015 and JHC-MW-15016 and selenium in JHC-MW-18002 were observed visually for a potential trend. No statistically significant trends were identified (Attachment 1 trend tests). Due to the changes in site conditions discussed above, potential trends in data will continue to be assessed as more data are collected. 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 (most recent 6 events for JHC-MW-18002). Eight independent sampling events provide the appropriate density of data as recommended per the Unified Guidance yet are collected recently enough to provide an indication of current condition. The test was run with a per-well

significance of α = 0.01. The software outputs are included in Attachment 1 along with data reports showing the values used for the evaluation. The percentage of non-detect observations are also included in Attachment 1. Non-detect data was handled in accordance with the Stats Plan for the purposes of calculating the confidence intervals.

The Sanitas™ software generates an output that includes graphs of the parametric or non-parametric confidence intervals for each well along with notes on data transformations, as appropriate. The data sets with direct exceedances of the molybdenum GWPS were found to be normally distributed, while the data set with a direct exceedance of the selenium GWPS in JHC-MW-18002 which was normalized using a square root transformation. The confidence interval test compares the lower confidence limit to the GWPS. The evaluation of the Appendix IV constituents shows no statistically significant exceedances of the GWPSs. This result is consistent with the results of the initial assessment monitoring data statistical evaluation and concentrations remain above background levels. Consumers Energy will continue semiannual assessment monitoring per §257.95 and execute the self-implementing groundwater compliance schedule in conformance with §257.90 - §257.98.

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 Ponds 3N/3S – RCRA CCR Monitoring Program
West Olive, Michigan

						Sample Location:	JHC-MW-15013											
						Sample Date:	8/15/2017	8/15/2017	9/26/2017	9/26/2017	4/30/2018	6/19/2018	11/14/2018	11/14/2018	2/27/2019	2/27/2019	4/29/2019	10/10/2019	4/16/2020
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS														
Appendix III								Field Dup		Field Dup				Field Dup		Field Dup			
Boron	ug/L	NC	NA	51	NA		153	171	147	151	--	258	318	312	330	330	320	300	55
Calcium	mg/L	NC	NA	46	NA		30.0	30.5	31.5	33.6	--	37.4	44.5	43.8	45	45	46	100	146
Chloride	mg/L	250*	NA	43	NA		15.2	15.3	15.2	15.2	--	16.2	16.9	17	18	18	16	17	9.48
Fluoride	ug/L	4,000	NA	1,000	NA		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	250*	NA	14	NA		33.4	33.5	30.9	30.9	--	34.8	32.9	32.3	30	30	30	230	276
Total Dissolved Solids	mg/L	500*	NA	258	NA		184	274	212	178	--	230	198	190	220	220	190	490	741
pH, Field	SU	6.5 - 8.5*	NA	4.8 - 9.2	NA		7.6	--	7.7	--	7.7	7.7	7.5	--	7.7 (1)	--	7.0	7.2	6.6
Appendix IV																			
Antimony	ug/L	6	NA	2	6		< 1.0	< 1.0	--	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1
Arsenic	ug/L	10	NA	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	35	2,000		15.4	15.3	--	--	16.1	21.4	22.1	22.4	25	23	25	53	73
Beryllium	ug/L	4	NA	1	4		< 1.0	< 1.0	--	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1
Cadmium	ug/L	5	NA	0.2	5		< 0.20	< 0.20	--	--	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.2
Chromium	ug/L	100	NA	2	100		< 1.0	< 1.0	--	--	1.5	2.9	2.3	3.2	< 1.0	< 1.0	2.0	7.3	< 1
Cobalt	ug/L	NC	6	15	15		< 15.0	< 15.0	--	--	< 15.0	< 15.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 15
Fluoride	ug/L	4,000	NA	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	1	15		< 1.0	< 1.0	--	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1
Lithium	ug/L	NC	40	10	40		< 10	< 10	--	--	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Mercury	ug/L	2	NA	0.2	2		< 0.20	< 0.20	--	--	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.2
Molybdenum	ug/L	NC	100	5	**100**		5.3	5.9	--	--	6.6	< 5.0	12.2	11.7	11	10	8.5	7.2	6
Radium-226	pCi/L	NC	NA	NA	NA		0.489	< 0.573	--	--	< 0.518	< 0.548	0.626	0.834	< 0.101	0.0854	0.121	0.485	0.222
Radium-228	pCi/L	NC	NA	NA	NA		< 0.689	< 0.764	--	--	< 0.670	< 0.990	< 0.955	< 0.847	< 0.373	< 0.423	< 0.377	0.960	< 0.580
Radium-226/228	pCi/L	5	NA	1.93	5		0.990	< 1.34	--	--	< 1.19	< 1.54	< 1.14	1.47	0.402	0.436	< 0.377	1.45	0.729
Selenium	ug/L	50	NA	5	**50**		< 1.0	< 1.0	--	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1
Thallium	ug/L	2	NA	2	2		< 2.0	< 2.0	--	--	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 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. GWPS is the higher of the MCL/RSL and UTL as established in TRC's Technical Memorandum dated October 15, 2018.
* - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April 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) Field meter reading not usable due to malfunctioning groundwater meter. Displayed value is lab pH reading from an unpreserved bottle.
(2) Monitoring wells JHC-MW-15015 and JHC-MW-15016 have been upgradient of Pond 3 since 2018 due to post-pond decommissioning groundwater flow direction changes and are no longer considered downgradient monitoring wells.

Table B1
Comparison of Groundwater Sampling Results to Groundwater Protection Standards for Statistical Evaluation
JH Campbell Ponds 3N/3S – RCRA CCR Monitoring Program
West Olive, Michigan

						Sample Location:	JHC-MW-15015[2]									
						Sample Date:	8/16/2017	9/27/2017	4/30/2018	6/19/2018	11/14/2018	2/27/2019	4/29/2019	10/10/2019	4/16/2020	4/16/2020
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS											Field Dup
Appendix III																
Boron	ug/L	NC	NA	51	NA		439	518	--	194	270	860	1,000	1,300	1,400	1,360
Calcium	mg/L	NC	NA	46	NA		59.0	58.8	--	57.3	128	110	100	110	162	162
Chloride	mg/L	250*	NA	43	NA		17.6	15.1	--	22.0	89.5	22	15	14	11.0	11.2
Fluoride	ug/L	4,000	NA	1,000	NA		< 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	14	NA		34.1	28.8	--	54.6	99.4	41	38	39	56.6	57.0
Total Dissolved Solids	mg/L	500*	NA	258	NA		222	328	--	362	626	420	430	430	597	600
pH, Field	SU	6.5 - 8.5*	NA	4.8 - 9.2	NA		7.3	7.3	7.1	7.3	7.3	7.7 [1]	7.1	7.2	6.7	--
Appendix IV																
Antimony	ug/L	6	NA	2	6		< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1
Arsenic	ug/L	10	NA	1	10		< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1
Barium	ug/L	2,000	NA	35	2,000		31.1	--	24.5	36.7	71.7	47	44	49	67	66
Beryllium	ug/L	4	NA	1	4		< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1
Cadmium	ug/L	5	NA	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	2	100		< 1.0	--	1.1	< 1.0	< 1.0	1.7	< 1.0	4.3	< 1	< 1
Cobalt	ug/L	NC	6	15	15		< 15.0	--	< 15.0	< 15.0	< 6.0	< 6.0	< 6.0	< 6.0	< 15	< 15
Fluoride	ug/L	4,000	NA	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	1	15		< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1
Lithium	ug/L	NC	40	10	40		< 10	--	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Mercury	ug/L	2	NA	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	5	**100**		15.2	--	11.7	11.2	37.9	**170**	**140**	**110**	52	50
Radium-226	pCi/L	NC	NA	NA	NA		< 0.550	--	< 0.708	< 0.506	< 0.528	< 0.0793	< 0.0921	0.207	< 0.125	< 0.125
Radium-228	pCi/L	NC	NA	NA	NA		< 0.774	--	< 0.809	< 0.750	0.922	< 0.360	< 0.419	< 0.432	< 0.577	0.576
Radium-226/228	pCi/L	5	NA	1.93	5		< 1.32	--	< 1.52	< 1.26	< 1.34	< 0.360	< 0.419	< 0.432	< 0.577	0.682
Selenium	ug/L	50	NA	5	**50**		7.5	--	< 1.0	17.9	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1
Thallium	ug/L	2	NA	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. GWPS is the higher of the MCL/RSL and UTL as established in TRC's Technical Memorandum dated October 15, 2018.
* - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April 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) Field meter reading not usable due to malfunctioning groundwater meter. Displayed value is lab pH reading from an unpreserved bottle.
(2) Monitoring wells JHC-MW-15015 and JHC-MW-15016 have been upgradient of Pond 3 since 2018 due to post-pond decommissioning groundwater flow direction changes and are no longer considered downgradient monitoring wells.

Table B1
Comparison of Groundwater Sampling Results to Groundwater Protection Standards for Statistical Evaluation
JH Campbell Ponds 3N/3S – RCRA CCR Monitoring Program
West Olive, Michigan

						Sample Location:	JHC-MW-15016[2]									
						Sample Date:	8/16/2017	9/27/2017	4/30/2018	7/18/2018	11/15/2018	2/28/2019	4/29/2019	10/10/2019	10/10/2019	4/16/2020
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS										Field Dup	
Appendix III																
Boron	ug/L	NC	NA	51	NA		171	279	--	291	340	1,100	2,100	4,200	4,200	5,060
Calcium	mg/L	NC	NA	46	NA		61.1	75.9	--	74.4	112	120	110	110	110	134
Chloride	mg/L	250*	NA	43	NA		24.5	21.8	--	43.6	73.8	27	26	16	17	8.76
Fluoride	ug/L	4,000	NA	1,000	NA		< 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	14	NA		56.0	62.6	--	31.9	23.5	23	23	26	26	18.2
Total Dissolved Solids	mg/L	500*	NA	258	NA		278	492	--	396	512	530	470	450	450	526
pH, Field	SU	6.5 - 8.5*	NA	4.8 - 9.2	NA		7.3	7.3	6.8	6.9	7.2	7.6 (1)	6.9	7.2	--	6.7
Appendix IV																
Antimony	ug/L	6	NA	2	6		< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1
Arsenic	ug/L	10	NA	1	10		< 1.0	--	1.8	< 1.0	4.6	< 1.0	2.6	< 1.0	< 1.0	2
Barium	ug/L	2,000	NA	35	2,000		38.8	--	70.2	56.2	94.5	110	99	88	83	100
Beryllium	ug/L	4	NA	1	4		< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1
Cadmium	ug/L	5	NA	0.2	5		< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.2
Chromium	ug/L	100	NA	2	100		2.5	--	< 1.0	< 1.0	< 1.0	3.3	2.5	1.6	1.7	< 1
Cobalt	ug/L	NC	6	15	15		< 15.0	--	< 15.0	< 15.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 15
Fluoride	ug/L	4,000	NA	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	1	15		< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1
Lithium	ug/L	NC	40	10	40		< 10	--	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Mercury	ug/L	2	NA	0.2	2		< 0.20	--	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.2
Molybdenum	ug/L	NC	100	5	**100**		30.7	--	**122**	100	80.0	44	42	27	25	59
Radium-226	pCi/L	NC	NA	NA	NA		< 0.754	--	< 0.898	< 0.647	0.514	0.149	0.239	0.322	--	0.274
Radium-228	pCi/L	NC	NA	NA	NA		< 0.659	--	< 0.951	1.61	1.29	0.520	< 0.482	< 0.482	--	< 0.751
Radium-226/228	pCi/L	5	NA	1.93	5		< 1.41	--	< 1.85	1.88	1.80	0.669	0.711	0.540	--	< 0.751
Selenium	ug/L	50	NA	5	**50**		2.2	--	< 1.0	2.2	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1
Thallium	ug/L	2	NA	2	2		< 2.0	--	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 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. GWPS is the higher of the MCL/RSL and UTL as established in TRC's Technical Memorandum dated October 15, 2018.
* - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April 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) Field meter reading not usable due to malfunctioning groundwater meter. Displayed value is lab pH reading from an unpreserved bottle.
(2) Monitoring wells JHC-MW-15015 and JHC-MW-15016 have been upgradient of Pond 3 since 2018 due to post-pond decommissioning groundwater flow direction changes and are no longer considered downgradient monitoring wells.

Table B1
Comparison of Groundwater Sampling Results to Groundwater Protection Standards for Statistical Evaluation
JH Campbell Ponds 3N/3S – RCRA CCR Monitoring Program
West Olive, Michigan

					Sample Location:	JHC-MW-18001						JHC-MW-18002						JHC-MW-18003							
					Sample Date:	12/12/2018	2/28/2019	4/25/2019	8/13/2019	10/10/2019	4/15/2020	12/12/2018	3/12/2019	4/25/2019	8/13/2019	10/10/2019	4/15/2020	12/7/2018	3/12/2019	3/12/2019	4/25/2019	8/13/2019	8/13/2019	10/10/2019	4/15/2020
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS															Field Dup			Field Dup		
Appendix III																									
Boron	ug/L	NC	NA	51	NA	304	310	300	330	390	376	301	300	290	340	330	273	197	210	220	270	330	340	510	283
Calcium	mg/L	NC	NA	46	NA	52.9	69	77	76	66	71.7	45.9	54	57	51	68	45.9	63.6	200	200	160	100	110	140	78.5
Chloride	mg/L	250*	NA	43	NA	13.4	15	11	2.6	2.2	5.01	14.9	17	15	18	17	3.32	15.3	10	10	11	10	11	10	11.7
Fluoride	ug/L	4,000	NA	1,000	NA	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	<1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	250*	NA	14	NA	51.7	86	130	140	82	94.1	35.6	46	83	67	58	45.9	116	640	630	450	250	250	340	88.9
Total Dissolved Solids	mg/L	500*	NA	258	NA	344	330	430	460	360	418	244	270	310	300	430	230	326	1,100	1,100	810	510	520	660	352
pH, Field	SU	6.5 - 8.5*	NA	4.8 - 9.2	NA	8.4	8.2(1)	8.3	8.2	8.1	8.2	7.7	7.2	7.3	7.3	7.3	7.3	7.4	6.9	--	6.9	7.0	--	6.9	7.2
Appendix IV																									
Antimony	ug/L	6	NA	2	6	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1.0	< 1.0	< 1.0	1.0	2.7	< 1	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1
Arsenic	ug/L	10	NA	1	10	< 1.0	1.5	1.4	1.7	1.5	2	< 1.0	1.2	< 1.0	1.4	< 1.0	< 1	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	1.4	< 1
Barium	ug/L	2,000	NA	35	2,000	225	360	440	610	390	529	79.5	96	110	130	130	108	81.5	150	150	120	100	96	130	97
Beryllium	ug/L	4	NA	1	4	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1
Cadmium	ug/L	5	NA	0.2	5	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.2	< 0.20	< 0.20	< 0.20	< 0.20	0.24	< 0.2	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.2
Chromium	ug/L	100	NA	2	100	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1.0	1.1	< 1.0	< 1.0	< 1.0	< 1	< 1.0	1.1	1.2	< 1.0	< 1.0	< 1.0	< 1.0	< 1
Cobalt	ug/L	NC	6	15	15	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 15	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 15	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 15
Fluoride	ug/L	4,000	NA	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	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	15	1	15	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1
Lithium	ug/L	NC	40	10	40	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	12	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Mercury	ug/L	2	NA	0.2	2	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.2	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.2	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.2
Molybdenum	ug/L	NC	100	5	**100**	9.6	9.2	8.1	16	17	18	12.4	11	10	13	15	15	10.9	10	10	12	10	10	12	19
Radium-226	pCi/L	NC	NA	NA	NA	< 0.886	0.177	0.321	0.469	0.296	0.284	0.631	0.125	0.144	< 0.195	0.198	< 0.105	< 0.757	0.131	<0.132	0.270	< 0.235	< 0.160	< 0.161	< 0.118
Radium-228	pCi/L	NC	NA	NA	NA	< 0.955	0.561	0.345	0.822	0.406	< 0.355	< 0.711	< 0.356	< 0.610	< 0.607	< 0.413	< 0.415	0.833	< 0.497	0.501	0.623	< 0.570	< 0.360	< 0.556	< 0.465
Radium-226/228	pCi/L	5	NA	1.93	5	< 1.84	0.738	0.667	1.29	0.702	0.463	< 1.30	0.428	< 0.610	< 0.607	< 0.413	< 0.415	< 1.54	< 0.497	0.613	0.892	< 0.570	< 0.360	< 0.556	< 0.465
Selenium	ug/L	50	NA	5	**50**	1.6	2.3	1.3	15	18	27	18.3	30	26	23	31	**57**	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	4
Thallium	ug/L	2	NA	2	2	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2

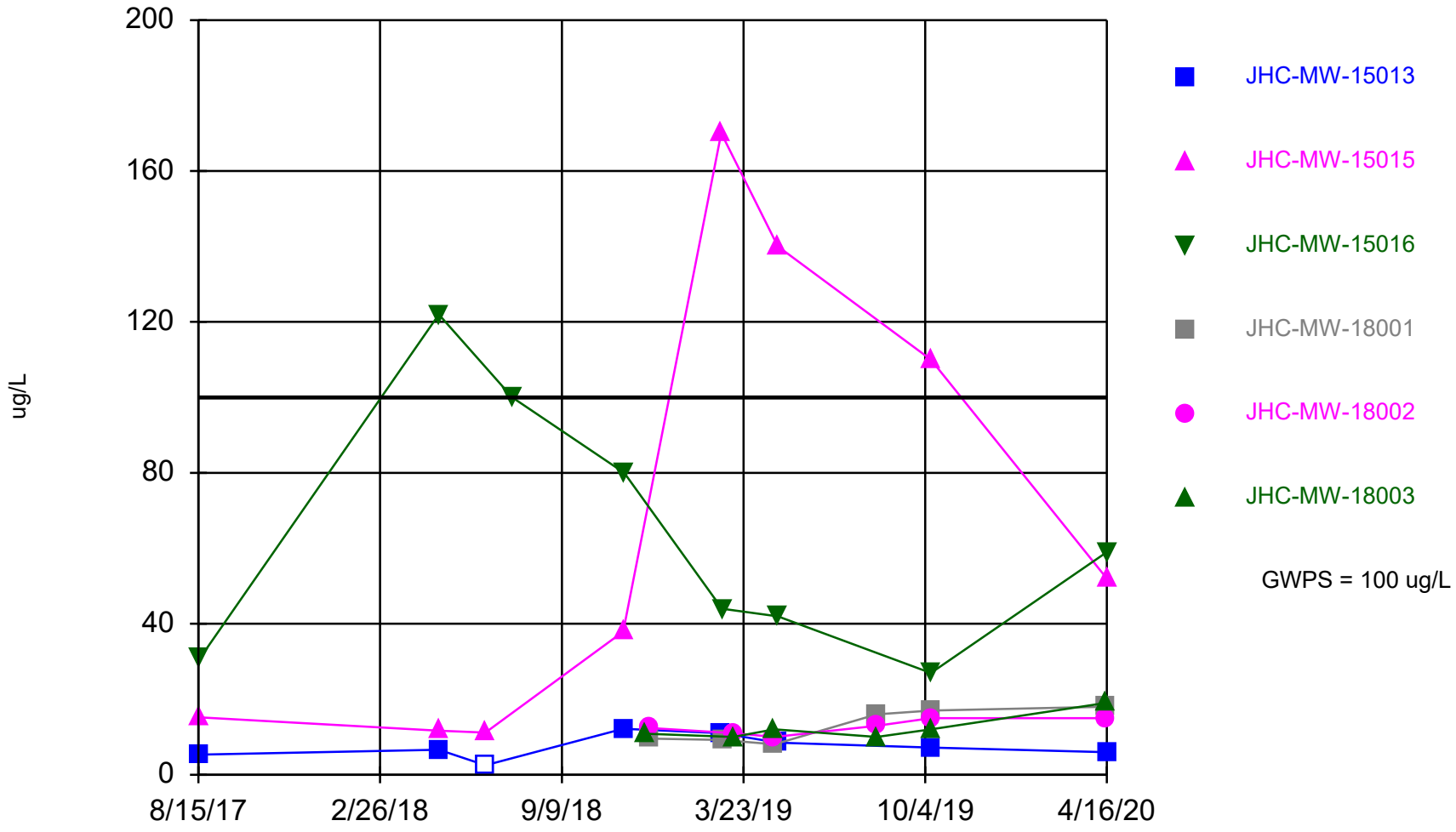
Notes:

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. GWPS is the higher of the MCL/RSL and UTL as established in TRC's Technical Memorandum dated October 15, 2018.
* - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April 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) Field meter reading not usable due to malfunctioning groundwater meter. Displayed value is lab pH reading from an unpreserved bottle.
(2) Monitoring wells JHC-MW-15015 and JHC-MW-15016 have been upgradient of Pond 3 since 2018 due to post-pond decommissioning groundwater flow direction changes and are no longer considered downgradient monitoring wells.

Attachment 1
Sanitas™ Output

Hollow symbols indicate censored values.

Molybdenum Comparison to GWPS

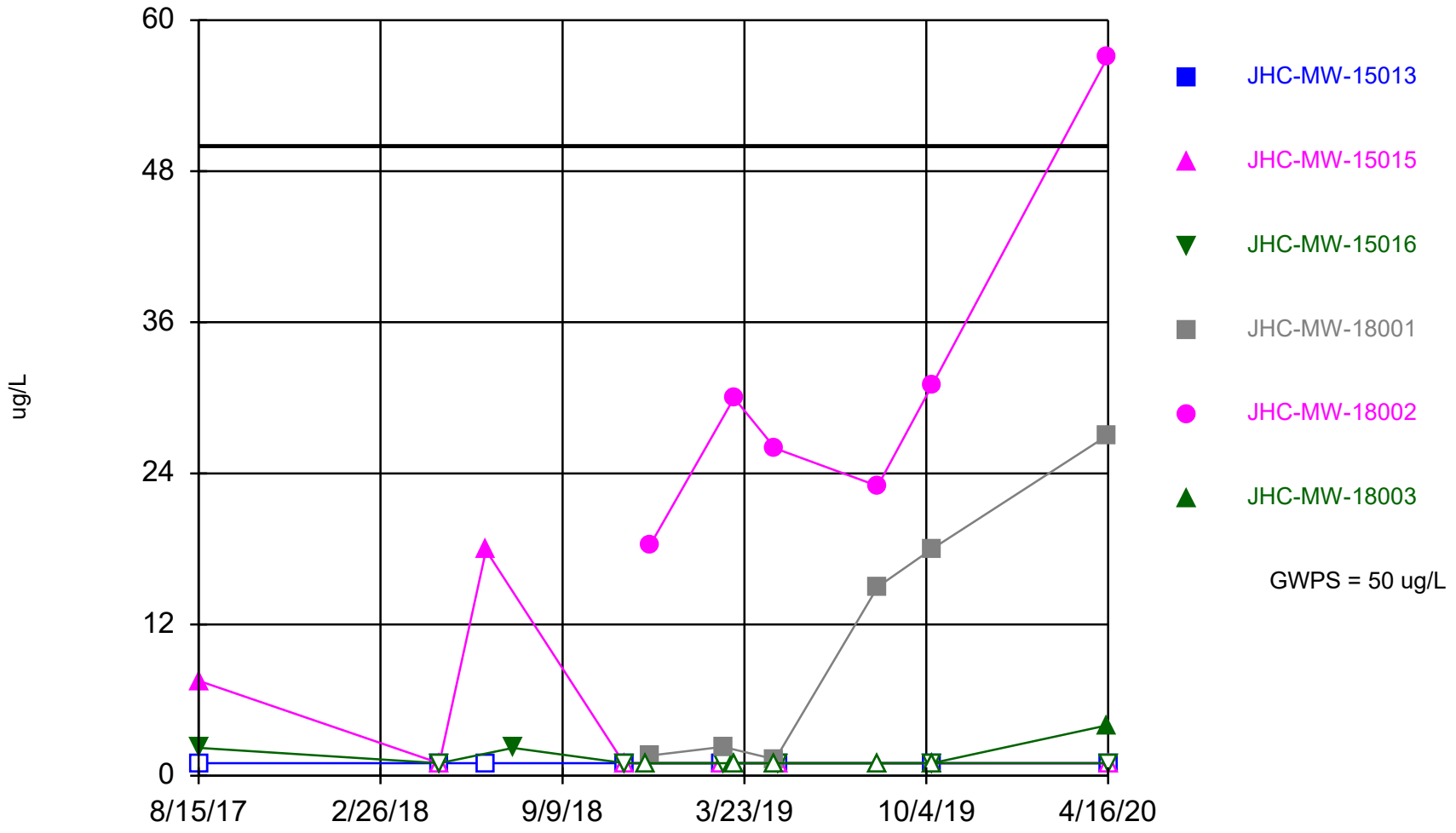


Time Series Analysis Run 1/14/2021 8:34 AM

Client: Consumers Energy Data: JHC_CCR_BG_Ponds123_LF_20.11.30

Hollow symbols indicate censored values.

Selenium Comparison to GWPS

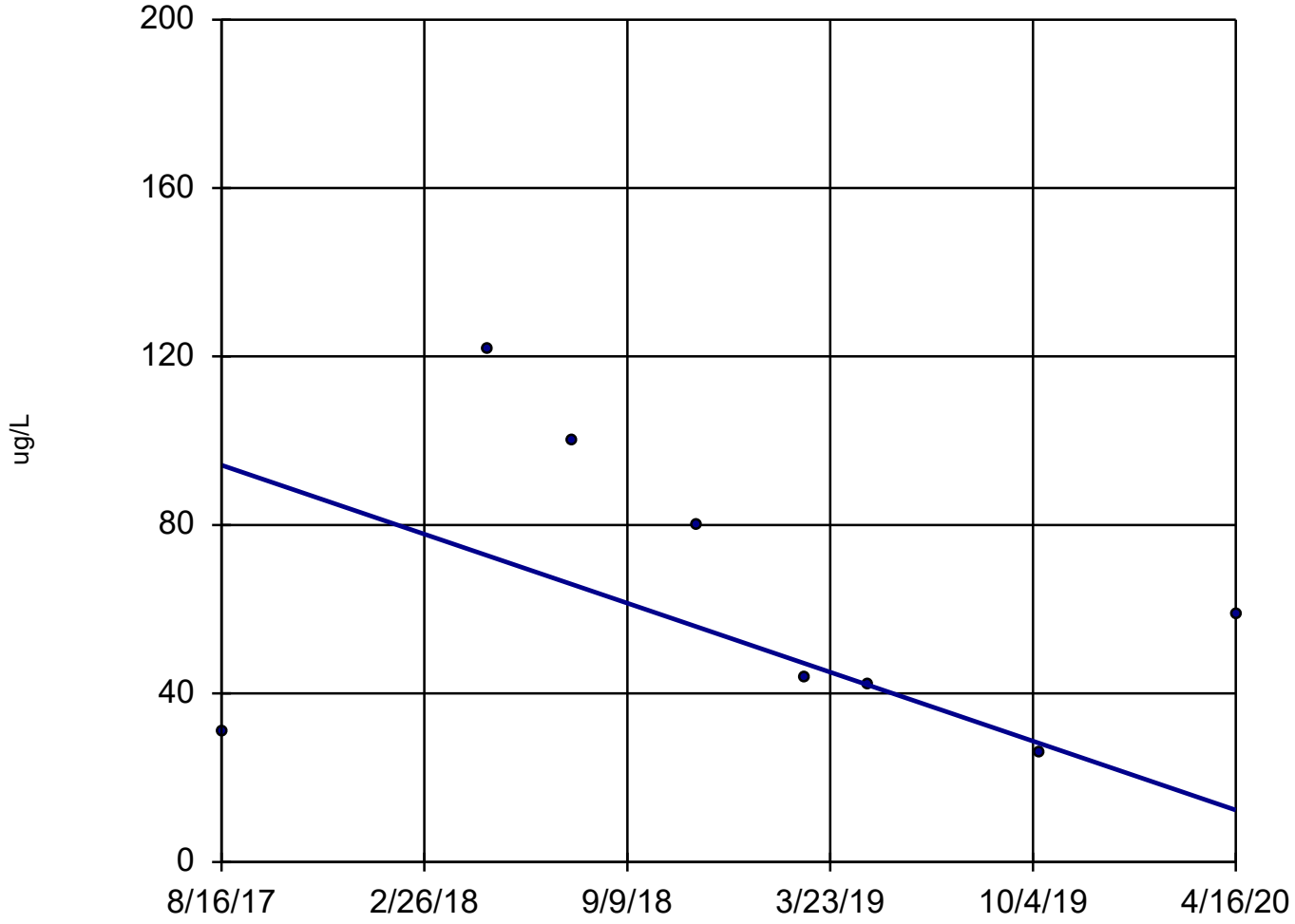


Time Series Analysis Run 1/14/2021 8:36 AM

Client: Consumers Energy Data: JHC_CCR_BG_Ponds123_LF_20.11.30

Sen's Slope Estimator

JHC-MW-15016



n = 8

Slope = -30.7 units per year.

Mann-Kendall statistic = -10
critical = -20

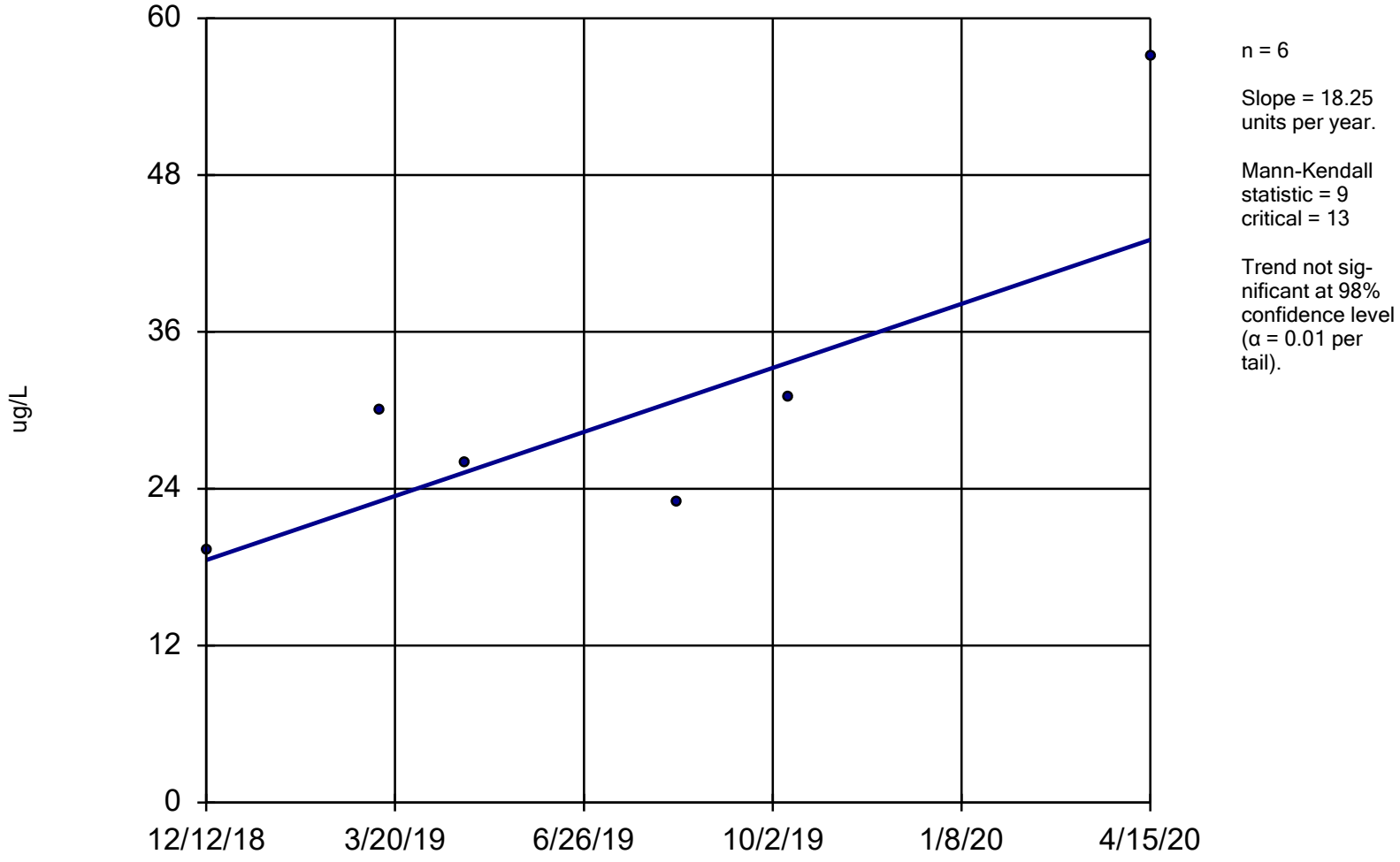
Trend not significant at 98% confidence level (α = 0.01 per tail).

Constituent: Molybdenum, Total Analysis Run 6/2/2020 3:38 PM

Client: Consumers Energy Data: JHC_Sanitas_20.05.28

Sen's Slope Estimator

JHC-MW-18002



n = 6

Slope = 18.25 units per year.

Mann-Kendall statistic = 9
critical = 13

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

Constituent: Selenium, Total Analysis Run 6/2/2020 3:40 PM

Client: Consumers Energy Data: JHC_Sanitas_20.05.28

Summary Report

Constituent: Molybdenum, Total Analysis Run 6/2/2020 3:35 PM
Client: Consumers Energy Data: JHC_Sanitas_20.05.28

For observations made between 8/15/2017 and 4/16/2020, a summary of the selected data set:

Observations = 42
ND/Trace = 1
Wells = 6
Minimum Value = 2.5
Maximum Value = 170
Mean Value = 31.85
Median Value = 12.73
Standard Deviation = 40.17
Coefficient of Variation = 1.261
Skewness = 2.014

Well	#Obs.	ND/Trace	Min	Max	Mean	Median	Std.Dev.	CV	Skewness
JHC-MW-15013	8	1	2.5	11.95	7.356	6.9	2.962	0.4026	0.03899
JHC-MW-15015	8	0	11.2	170	68.38	44.45	62.94	0.9205	0.5735
JHC-MW-15016	8	0	26	122	62.96	51.5	34.58	0.5492	0.5961
JHC-MW-18001	6	0	8.1	18	12.98	12.8	4.472	0.3445	0.02247
JHC-MW-18002	6	0	10	15	12.74	12.73	2.045	0.1605	-0.07341
JHC-MW-18003	6	0	10	19	12.32	11.45	3.394	0.2756	1.517

Summary Report

Constituent: Selenium, Total Analysis Run 6/2/2020 3:37 PM
Client: Consumers Energy Data: JHC_Sanitas_20.05.28

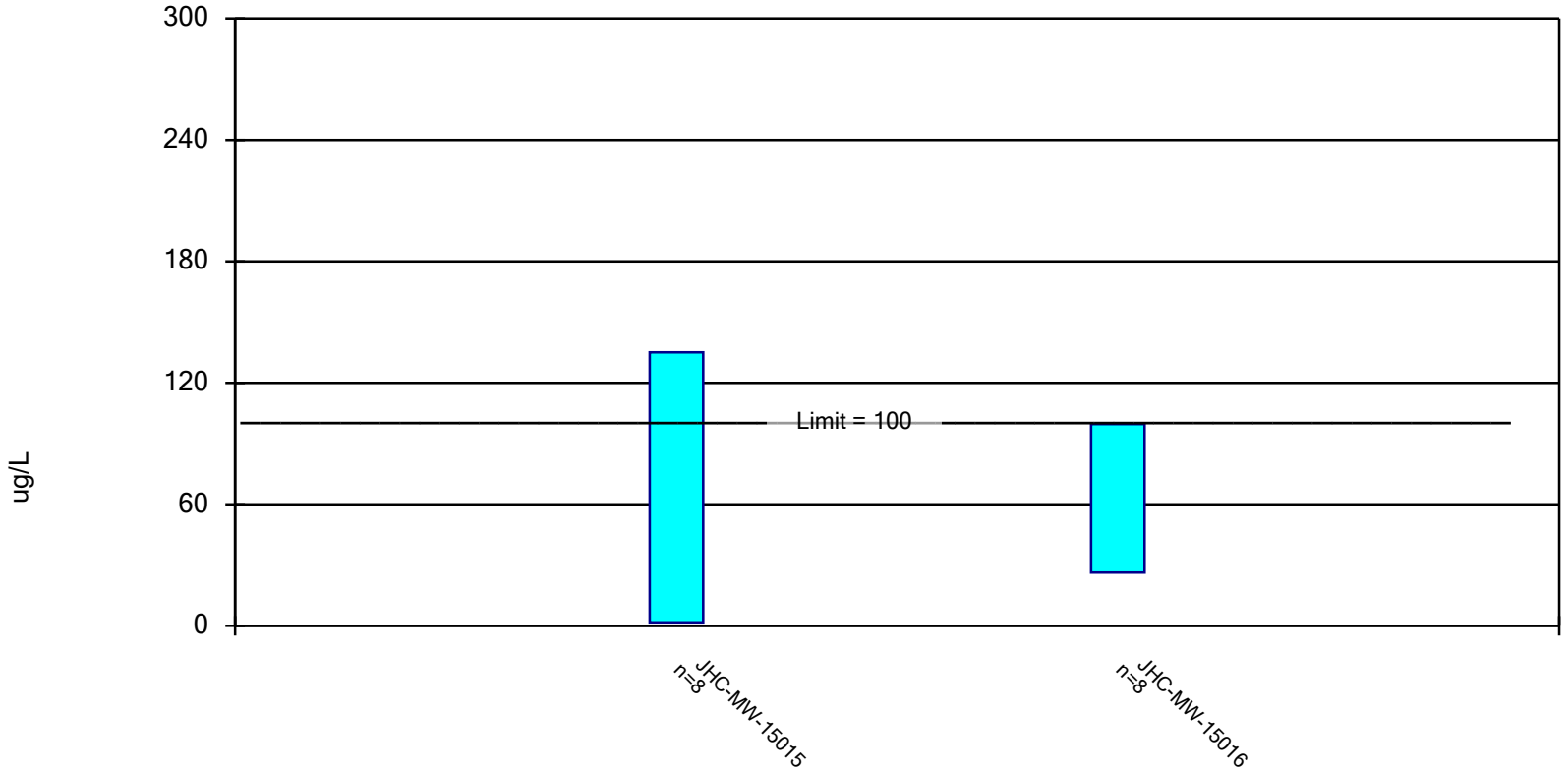
For observations made between 8/15/2017 and 4/16/2020, a summary of the selected data set:

Observations = 42
ND/Trace = 25
Wells = 6
Minimum Value = 1
Maximum Value = 57
Mean Value = 7.388
Median Value = 1
Standard Deviation = 12.21
Coefficient of Variation = 1.652
Skewness = 2.195

Well	#Obs.	ND/Trace	Min	Max	Mean	Median	Std.Dev.	CV	Skewness
JHC-MW-15013	8	8	1	1	1	1	0	0	NaN
JHC-MW-15015	8	6	1	17.9	3.925	1	6.088	1.551	1.777
JHC-MW-15016	8	6	1	2.2	1.3	1	0.5555	0.4273	1.155
JHC-MW-18001	6	0	1.3	27	10.87	8.65	10.76	0.9903	0.4101
JHC-MW-18002	6	0	19.3	57	31.05	28	13.44	0.4328	1.372
JHC-MW-18003	6	5	1	4	1.5	1	1.225	0.8165	1.789

Parametric Confidence Interval

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



Constituent: Molybdenum, Total Analysis Run 6/2/2020 3:43 PM

Client: Consumers Energy Data: JHC_Sanitas_20.05.28

Confidence Interval

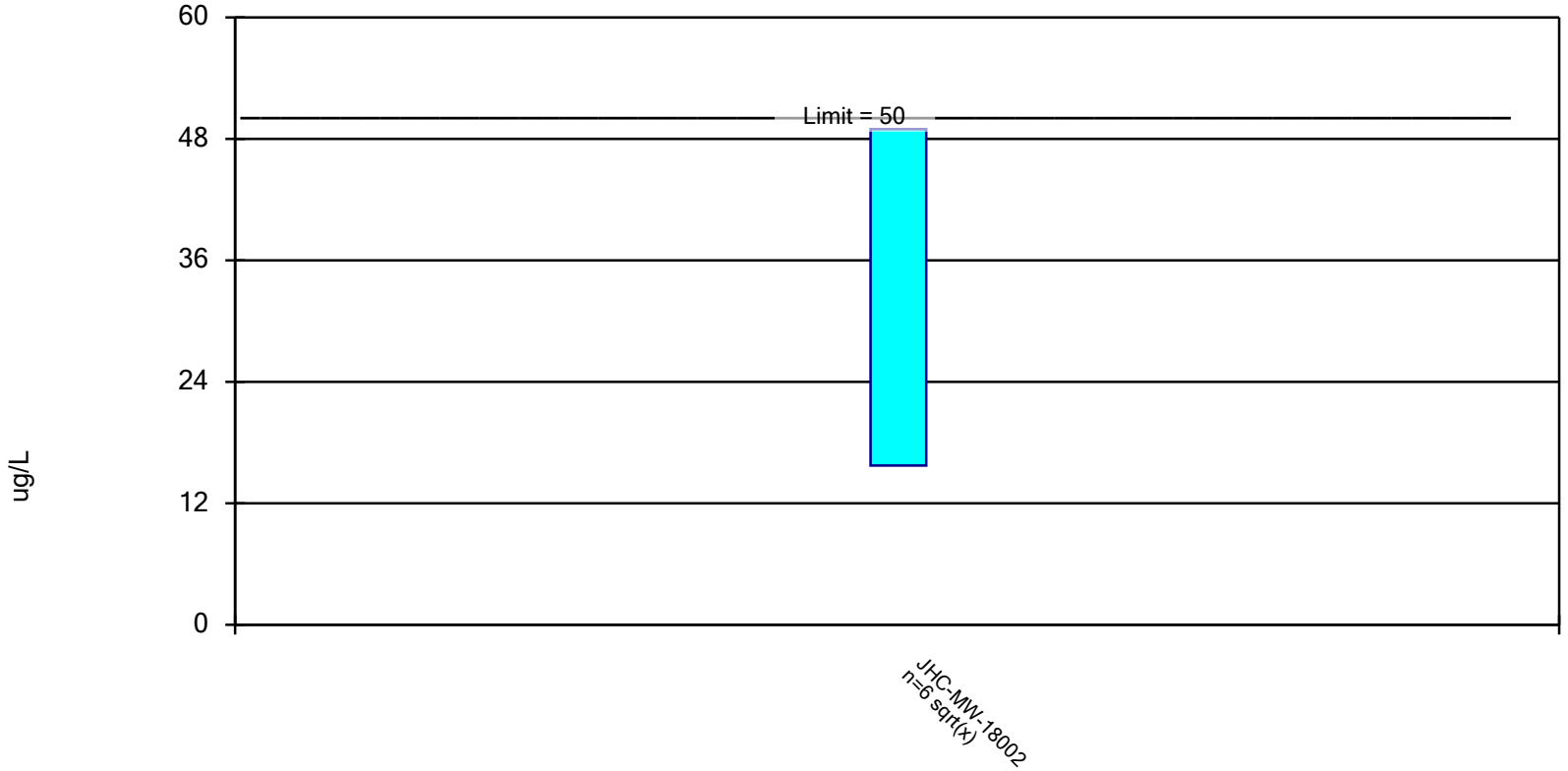
Constituent: Molybdenum, Total (ug/L) Analysis Run 6/2/2020 3:46 PM

Client: Consumers Energy Data: JHC_Sanitas_20.05.28

	JHC-MW-15015	JHC-MW-15016
8/16/2017	15.2	30.7
4/30/2018	11.7	122
6/19/2018	11.2	
7/18/2018		100
11/14/2018	37.9	
11/15/2018		80
2/27/2019	170	
2/28/2019		44
4/29/2019	140	42
10/10/2019	110	26 (D)
4/16/2020	51 (D)	59
Mean	68.38	62.96
Std. Dev.	62.94	34.58
Upper Lim.	135.1	99.61
Lower Lim.	1.663	26.31

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 6/2/2020 3:46 PM

Client: Consumers Energy Data: JHC_Sanitas_20.05.28

Confidence Interval

Constituent: Selenium, Total (ug/L) Analysis Run 6/2/2020 3:47 PM

Client: Consumers Energy Data: JHC_Sanitas_20.05.28

	JHC-MW-18002
12/12/2018	19.3 (D)
3/12/2019	30
4/25/2019	26
8/13/2019	23
10/10/2019	31
4/15/2020	57
Mean	31.05
Std. Dev.	13.44
Upper Lim.	48.95
Lower Lim.	15.72

Appendix C
October 2020 Assessment Monitoring Statistical Evaluation

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Technical Memorandum

Date:	January 29, 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 Bottom Ash Pond 3 North and 3 South CCR Unit, Consumers Energy Company, West Olive, Michigan

During the statistical evaluation of the initial assessment monitoring event, no Appendix IV constituents were present at statistically significant levels exceeding the Groundwater Protections Standards (GWPSs). Therefore, Consumers Energy Company (Consumers Energy) is continuing semiannual assessment monitoring in accordance with §257.95 of the CCR Rule[1] at the JH Campbell Power Plant (JHC) Bottom Ash Pond 3 North and 3 South (Pond 3). The second semiannual assessment monitoring event for 2020 was conducted on October 19 through 23, 2020. In accordance with §257.95, the assessment monitoring data must be compared to GWPSs to determine whether or not Appendix IV constituents are detected at statistically significant levels above the GWPSs. GWPSs were established in accordance with §257.95(h), as described in the October 15, 2018 Groundwater Protection Standards technical memorandum, which was also included in the 2018 Annual Groundwater Monitoring Report (2018 Annual Report) (TRC, January 2019). The following narrative describes the methods that were employed for comparisons to the GWPSs. The results obtained and the Sanitas™ output files are included as an attachment.

The statistical evaluation of the second semiannual assessment monitoring event data for 2020 indicates that no constituents are present at statistically significant levels exceeding the GWPSs in downgradient monitoring wells at the JHC Pond 3 CCR unit. This result is consistent with the results of previous assessment monitoring data statistical evaluations and concentrations remain above background levels. Consumers Energy will continue semiannual assessment monitoring per §257.95 and execute the self-implementing groundwater compliance schedule in conformance with §257.90 - §257.98.

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

Assessment Monitoring Statistical Evaluation

The compliance well network at the JHC Pond 3 CCR Unit consists of six monitoring wells. JHC-MW-15013, JHC-MW-15015, and JHC-MW-15016 are located on the eastern perimeter of the bottom ash ponds. Former downgradient monitoring well JHC-MW-15012 was decommissioned on October 10, 2018 during deconstruction of Bottom Ash Pond Unit 3 South; therefore, statistical analysis for JHC-MW-15012 terminates at the June 2018 monitoring event. Due to the cessation of hydraulic loading to Ponds 1-2 and Pond 3, the groundwater flow direction changed significantly from the previous baseline and assessment monitoring events. Because of the changes in site conditions and groundwater flow direction, monitoring wells JHC-MW-15015 and JHC-MW-15016 are no longer positioned downgradient from Pond 3. In response, as documented in the 2018 Annual Report, Consumers Energy installed three new downgradient wells (JHC-MW-18001 through JHC-MW-18003) on the west and southwest edge of former Pond 3 from December 3 through December 5, 2018 to reassess groundwater flow and ensure sufficient wells are appropriately located to assess groundwater quality downgradient from the Pond 3 CCR Unit. These wells were sampled quarterly for Appendix III and Appendix IV constituents from December 2018 through October 2019 (5 quarterly events) in addition to the April 2020 semiannual assessment monitoring event. These data confirm that the monitoring wells are appropriately positioned to assess groundwater quality downgradient from Pond 3. Therefore, JHC-MW-18001 through JHC-MW-18003 were added to the downgradient monitoring network for Pond 3 and are included in the statistical evaluations.

Following the second semiannual assessment monitoring event for 2020, compliance well data for the JHC Pond 3 were evaluated in accordance with the Groundwater Statistical Evaluation Plan (Stats Plan) (TRC, October 2017). 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 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 Guidance[2], 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 the lower and upper confidence limits.

The concentrations observed in the downgradient wells are deemed to be a statistically significant exceedance when the 99 percent lower confidence limit of the downgradient data exceeds the GWPS. If the confidence interval straddles the GWPS (i.e. the lower confidence level is below the GWPS but the upper confidence level is above), the statistical test result indicates that there is insufficient confidence that the measured concentrations are different from the GWPS and thus there is no compelling evidence that the measured concentration is a result of a release from the CCR unit versus the inherent variability of the sample data. This statistical approach is consistent with the

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

statistical methods for assessment monitoring presented in §257.93(f) and (g). Statistical evaluation methodologies built into the CCR Rule, and numerous other federal rules, are key in determining whether or not individually measured data points represent a concentration increase over the baseline or a fixed standard (such as a GWPS in an assessment monitoring program).

For each detected Appendix IV constituent, the concentrations for each well were first compared directly to the GWPS, as shown on Table C1. Constituent-well combinations with a direct exceedance of the GWPS within the past 8 events (September 2017 through October 2020) for JHC-MW-15013, JHC-MW-15015, and JHC-MW-15016 and the past seven events (December 2018 through October 2020) for JHC-MW-18001 through JHC-MW-18003 were retained for further analysis. Molybdenum in JHC-MW-15015 and JHC-MW-15016 and selenium in JHC-MW-18002 at Pond 3 had individual results exceeding the GWPS within the past 8 or so sampling events. No constituents directly exceeded the GWPS during the second semiannual assessment monitoring event for 2020.

As discussed above, JHC-MW-15015 and JHC-MW-15016 are located hydraulically upgradient of Pond 3 since 2018. During the timeframe between the last background monitoring event in August 2017 and the assessment monitoring events in 2018 (JHC-MW-15016) and 2019 (JHC-MW-15015), molybdenum concentrations at these wells showed an initial increase followed by a general decrease (see trend charts in Attachment 1). Considering the timing of these increases, the location of the wells hydraulically upgradient from Pond 3, and the timing of CCR removal, it is likely that the groundwater quality measured at monitoring well JHC-MW-15015 and JHC-MW-15016 is more representative of groundwater flowing toward the CCR unit from the northeast, prior to being influenced by the Pond 3 CCR unit. CCR removal activities in the southern portion of JHC Pond 3 were completed in October 2018, so groundwater conditions were re-equilibrating at the time of the assessment monitoring sampling events during which the molybdenum concentration in JHC-MW-15015 and JHC-MW-15016 exceeded their GWPS by direct comparison. The molybdenum data have been retained in the assessment monitoring data set for this assessment monitoring data evaluation in order to remain conservative while hydrogeological conditions are stabilizing and to continue to monitor data quality at those locations post-CCR removal.

Groundwater data for the monitoring wells with individual results exceeding a GWPS by direct comparison were evaluated utilizing Sanitas™ statistical software. Sanitas™ is a software tool that is commercially available for performing statistical evaluation consistent with procedures outlined in the Unified Guidance. Within the Sanitas™ statistical program, confidence limits were selected to perform the statistical comparison of compliance data to a fixed standard. Parametric confidence intervals were calculated for each of the three CCR Appendix IV data sets with a direct exceedance of a GWPS using a 99 percent confidence level, 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 (August 2017) results and assessment monitoring results (April 2018 through October 2020) for molybdenum in JHC-MW-15015 and JHC-MW-15016 and selenium in JHC-MW-18002 were observed visually for a potential trend. No statistically significant trends were identified (Attachment 1 trend tests). Due to the changes in site conditions discussed above, potential trends in data will continue to be assessed as more data are collected. 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 (most recent seven events for JHC-MW-18002). Eight independent sampling events provide the appropriate density of data as recommended per the Unified Guidance yet are collected recently enough to provide an indication of current condition. The test was 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 was handled in accordance with the Stats Plan for the purposes of calculating the confidence intervals.

The Sanitas™ software generates an output that includes graphs of the parametric or non-parametric confidence intervals for each well along with notes on data transformations, as appropriate. All data sets with direct exceedances of the GWPS were found to be normally distributed. The confidence interval test compares the lower confidence limit to the GWPS. The evaluation of the Appendix IV constituents shows no statistically significant exceedances of the GWPSs. This result is consistent with the results of the initial assessment monitoring data statistical evaluation and concentrations remain above background levels. Consumers Energy will continue semiannual assessment monitoring per §257.95 and execute the self-implementing groundwater compliance schedule in conformance with §257.90 - §257.98.

Attachments

Table C1 Comparison of Groundwater Sampling Results to Groundwater Protection Standards for Statistical Evaluation

Attachment 1 Sanitas™ Output

Table

Table C1
Comparison of Groundwater Sampling Results to Groundwater Protection Standards for Statistical Evaluation
JH Campbell Ponds 3N/3S – RCRA CCR Monitoring Program
West Olive, Michigan

						Sample Location:	JHC-MW-15013											
						Sample Date:	9/26/2017	9/26/2017	4/30/2018	6/19/2018	11/14/2018	11/14/2018	2/27/2019	2/27/2019	4/29/2019	10/10/2019	4/16/2020	10/22/2020	10/22/2020
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS														
Appendix III								Field Dup				Field Dup		Field Dup					Field Dup
Boron	ug/L	NC	NA	51	NA		147	151	--	258	318	312	330	330	320	300	55	279	278
Calcium	mg/L	NC	NA	46	NA		31.5	33.6	--	37.4	44.5	43.8	45	45	46	100	146	143	140
Chloride	mg/L	250*	NA	43	NA		15.2	15.2	--	16.2	16.9	17	18	18	16	17	9.48	11.7	11.6
Fluoride	ug/L	4,000	NA	1,000	NA		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	250*	NA	14	NA		30.9	30.9	--	34.8	32.9	32.3	30	30	30	230	276	205	202
Total Dissolved Solids	mg/L	500*	NA	258	NA		212	178	--	230	198	190	220	220	190	490	741	659	669
pH, Field	SU	6.5 - 8.5*	NA	4.8 - 9.2	NA		7.7	--	7.7	7.7	7.5	--	7.7 (1)	--	7.0	7.2	6.6	6.7	--
Appendix IV																			
Antimony	ug/L	6	NA	2	6		--	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1
Arsenic	ug/L	10	NA	1	10		--	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	1.1	< 1	< 1	< 1
Barium	ug/L	2,000	NA	35	2,000		--	--	16.1	21.4	22.1	22.4	25	23	25	53	73	66	65
Beryllium	ug/L	4	NA	1	4		--	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1
Cadmium	ug/L	5	NA	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
Chromium	ug/L	100	NA	2	100		--	--	1.5	2.9	2.3	3.2	< 1.0	< 1.0	2.0	7.3	< 1	1	1
Cobalt	ug/L	NC	6	15	15		--	--	< 15.0	< 15.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 15	< 15	< 15
Fluoride	ug/L	4,000	NA	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	1	15		--	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1
Lithium	ug/L	NC	40	10	40		--	--	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Mercury	ug/L	2	NA	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
Molybdenum	ug/L	NC	100	5	**100**		--	--	6.6	< 5.0	12.2	11.7	11	10	8.5	7.2	6	7	6
Radium-226	pCi/L	NC	NA	NA	NA		--	--	< 0.518	< 0.548	0.626	0.834	< 0.101	0.0854	0.121	0.485	0.222	< 0.368	< 0.326
Radium-228	pCi/L	NC	NA	NA	NA		--	--	< 0.670	< 0.990	< 0.955	< 0.847	< 0.373	< 0.423	< 0.377	0.960	< 0.580	< 0.398	< 0.496
Radium-226/228	pCi/L	5	NA	1.93	5		--	--	< 1.19	< 1.54	< 1.14	1.47	0.402	0.436	< 0.377	1.45	0.729	0.603	< 0.496
Selenium	ug/L	50	NA	5	**50**		--	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1
Thallium	ug/L	2	NA	2	2		--	--	< 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. GWPS is the higher of the MCL/RSL and UTL as established in TRC's Technical Memorandum dated October 15, 2018.
* - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April 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) Field meter reading not usable due to malfunctioning groundwater meter. Displayed value is lab pH reading from an unpreserved bottle.
(2) Monitoring wells JHC-MW-15015 and JHC-MW-15016 have been upgradient of Pond 3 since 2018 due to post-pond decommissioning groundwater flow direction changes and are no longer considered downgradient monitoring wells.

Table C1
Comparison of Groundwater Sampling Results to Groundwater Protection Standards for Statistical Evaluation
JH Campbell Ponds 3N/3S – RCRA CCR Monitoring Program
West Olive, Michigan

						Sample Location:	JHC-MW-15015[2]								
						Sample Date:	9/27/2017	4/30/2018	6/19/2018	11/14/2018	2/27/2019	4/29/2019	10/10/2019	4/16/2020	4/16/2020	10/23/2020
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS										Field Dup	
Appendix III																
Boron	ug/L	NC	NA	51	NA		518	--	194	270	860	1,000	1,300	1,400	1,360	1,770
Calcium	mg/L	NC	NA	46	NA		58.8	--	57.3	128	110	100	110	162	162	142
Chloride	mg/L	250*	NA	43	NA		15.1	--	22.0	89.5	22	15	14	11.0	11.2	7.21
Fluoride	ug/L	4,000	NA	1,000	NA		< 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	14	NA		28.8	--	54.6	99.4	41	38	39	56.6	57.0	36.6
Total Dissolved Solids	mg/L	500*	NA	258	NA		328	--	362	626	420	430	430	597	600	510
pH, Field	SU	6.5 - 8.5*	NA	4.8 - 9.2	NA		7.3	7.1	7.3	7.3	7.7 [1]	7.1	7.2	6.7	--	6.8
Appendix IV																
Antimony	ug/L	6	NA	2	6		--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1
Arsenic	ug/L	10	NA	1	10		--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1
Barium	ug/L	2,000	NA	35	2,000		--	24.5	36.7	71.7	47	44	49	67	66	53
Beryllium	ug/L	4	NA	1	4		--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1
Cadmium	ug/L	5	NA	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	2	100		--	1.1	< 1.0	< 1.0	1.7	< 1.0	4.3	< 1	< 1	< 1
Cobalt	ug/L	NC	6	15	15		--	< 15.0	< 15.0	< 6.0	< 6.0	< 6.0	< 6.0	< 15	< 15	< 15
Fluoride	ug/L	4,000	NA	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	1	15		--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1
Lithium	ug/L	NC	40	10	40		--	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Mercury	ug/L	2	NA	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	5	**100**		--	11.7	11.2	37.9	**170**	**140**	**110**	52	50	27
Radium-226	pCi/L	NC	NA	NA	NA		--	< 0.708	< 0.506	< 0.528	< 0.0793	< 0.0921	0.207	< 0.125	< 0.125	< 0.428
Radium-228	pCi/L	NC	NA	NA	NA		--	< 0.809	< 0.750	0.922	< 0.360	< 0.419	< 0.432	< 0.577	0.576	< 0.361
Radium-226/228	pCi/L	5	NA	1.93	5		--	< 1.52	< 1.26	< 1.34	< 0.360	< 0.419	< 0.432	< 0.577	0.682	< 0.428
Selenium	ug/L	50	NA	5	**50**		--	< 1.0	17.9	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1
Thallium	ug/L	2	NA	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. GWPS is the higher of the MCL/RSL and UTL as established in TRC's Technical Memorandum dated October 15, 2018.
* - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April 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) Field meter reading not usable due to malfunctioning groundwater meter. Displayed value is lab pH reading from an unpreserved bottle.
(2) Monitoring wells JHC-MW-15015 and JHC-MW-15016 have been upgradient of Pond 3 since 2018 due to post-pond decommissioning groundwater flow direction changes and are no longer considered downgradient monitoring wells.

Table C1
Comparison of Groundwater Sampling Results to Groundwater Protection Standards for Statistical Evaluation
JH Campbell Ponds 3N/3S – RCRA CCR Monitoring Program
West Olive, Michigan

					Sample Location:	JHC-MW-15016[2]									
					Sample Date:	9/27/2017	4/30/2018	7/18/2018	11/15/2018	2/28/2019	4/29/2019	10/10/2019	10/10/2019	4/16/2020	10/23/2020
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS								Field Dup		
Appendix III															
Boron	ug/L	NC	NA	51	NA	279	--	291	340	1,100	2,100	4,200	4,200	5,060	6,390
Calcium	mg/L	NC	NA	46	NA	75.9	--	74.4	112	120	110	110	110	134	95.9
Chloride	mg/L	250*	NA	43	NA	21.8	--	43.6	73.8	27	26	16	17	8.76	5.88
Fluoride	ug/L	4,000	NA	1,000	NA	< 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	14	NA	62.6	--	31.9	23.5	23	23	26	26	18.2	15.8
Total Dissolved Solids	mg/L	500*	NA	258	NA	492	--	396	512	530	470	450	450	526	405
pH, Field	SU	6.5 - 8.5*	NA	4.8 - 9.2	NA	7.3	6.8	6.9	7.2	7.6 [1]	6.9	7.2	--	6.7	6.9
Appendix IV															
Antimony	ug/L	6	NA	2	6	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1
Arsenic	ug/L	10	NA	1	10	--	1.8	< 1.0	4.6	< 1.0	2.6	< 1.0	< 1.0	2	1
Barium	ug/L	2,000	NA	35	2,000	--	70.2	56.2	94.5	110	99	88	83	100	100
Beryllium	ug/L	4	NA	1	4	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1
Cadmium	ug/L	5	NA	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	2	100	--	< 1.0	< 1.0	< 1.0	3.3	2.5	1.6	1.7	< 1	1
Cobalt	ug/L	NC	6	15	15	--	< 15.0	< 15.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 15	< 15
Fluoride	ug/L	4,000	NA	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	1	15	--	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1
Lithium	ug/L	NC	40	10	40	--	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Mercury	ug/L	2	NA	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	5	**100**	--	**122**	100	80.0	44	42	27	25	59	75
Radium-226	pCi/L	NC	NA	NA	NA	--	< 0.898	< 0.647	0.514	0.149	0.239	0.322	--	0.274	< 0.355
Radium-228	pCi/L	NC	NA	NA	NA	--	< 0.951	1.61	1.29	0.520	< 0.482	< 0.482	--	< 0.751	< 0.453
Radium-226/228	pCi/L	5	NA	1.93	5	--	< 1.85	1.88	1.80	0.669	0.711	0.540	--	< 0.751	0.506
Selenium	ug/L	50	NA	5	**50**	--	< 1.0	2.2	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1
Thallium	ug/L	2	NA	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. GWPS is the higher of the MCL/RSL and UTL as established in TRC's Technical Memorandum dated October 15, 2018.
* - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April 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) Field meter reading not usable due to malfunctioning groundwater meter. Displayed value is lab pH reading from an unpreserved bottle.
(2) Monitoring wells JHC-MW-15015 and JHC-MW-15016 have been upgradient of Pond 3 since 2018 due to post-pond decommissioning groundwater flow direction changes and are no longer considered downgradient monitoring wells.

Table C1
Comparison of Groundwater Sampling Results to Groundwater Protection Standards for Statistical Evaluation
JH Campbell Ponds 3N/3S – RCRA CCR Monitoring Program
West Olive, Michigan

						Sample Location:	JHC-MW-18001						
						Sample Date:	12/12/2018	2/28/2019	4/25/2019	8/13/2019	10/10/2019	4/15/2020	10/23/2020
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS								
Appendix III													
Boron	ug/L	NC	NA	51	NA		304	310	300	330	390	376	476
Calcium	mg/L	NC	NA	46	NA		52.9	69	77	76	66	71.7	74.8
Chloride	mg/L	250*	NA	43	NA		13.4	15	11	2.6	2.2	5.01	9.24
Fluoride	ug/L	4,000	NA	1,000	NA		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	250*	NA	14	NA		51.7	86	130	140	82	94.1	174
Total Dissolved Solids	mg/L	500*	NA	258	NA		344	330	430	460	360	418	528
pH, Field	SU	6.5 - 8.5*	NA	4.8 - 9.2	NA		8.4	8.2(1)	8.3	8.2	8.1	8.2	7.8
Appendix IV													
Antimony	ug/L	6	NA	2	6		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1
Arsenic	ug/L	10	NA	1	10		< 1.0	1.5	1.4	1.7	1.5	2	2
Barium	ug/L	2,000	NA	35	2,000		225	360	440	610	390	529	659
Beryllium	ug/L	4	NA	1	4		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1
Cadmium	ug/L	5	NA	0.2	5		< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.2	< 0.2
Chromium	ug/L	100	NA	2	100		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	1
Cobalt	ug/L	NC	6	15	15		< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 15	< 15
Fluoride	ug/L	4,000	NA	1,000	4,000		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	15	1	15		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1
Lithium	ug/L	NC	40	10	40		< 10	< 10	< 10	< 10	< 10	< 10	< 10
Mercury	ug/L	2	NA	0.2	2		< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.2	< 0.2
Molybdenum	ug/L	NC	100	5	**100**		9.6	9.2	8.1	16	17	18	17
Radium-226	pCi/L	NC	NA	NA	NA		< 0.886	0.177	0.321	0.469	0.296	0.284	0.464
Radium-228	pCi/L	NC	NA	NA	NA		< 0.955	0.561	0.345	0.822	0.406	< 0.355	< 0.408
Radium-226/228	pCi/L	5	NA	1.93	5		< 1.84	0.738	0.667	1.29	0.702	0.463	0.621
Selenium	ug/L	50	NA	5	**50**		1.6	2.3	1.3	15	18	27	7
Thallium	ug/L	2	NA	2	2		< 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. GWPS is the higher of the MCL/RSL and UTL as established in TRC's Technical Memorandum dated October 15, 2018.
* - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April 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) Field meter reading not usable due to malfunctioning groundwater meter. Displayed value is lab pH reading from an unpreserved bottle.
(2) Monitoring wells JHC-MW-15015 and JHC-MW-15016 have been upgradient of Pond 3 since 2018 due to post-pond decommissioning groundwater flow direction changes and are no longer considered downgradient monitoring wells.

Table C1
Comparison of Groundwater Sampling Results to Groundwater Protection Standards for Statistical Evaluation
JH Campbell Ponds 3N/3S – RCRA CCR Monitoring Program
West Olive, Michigan

						Sample Location:	JHC-MW-18002						
						Sample Date:	12/12/2018	3/12/2019	4/25/2019	8/13/2019	10/10/2019	4/15/2020	10/22/2020
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS								
Appendix III													
Boron	ug/L	NC	NA	51	NA		301	300	290	340	330	273	272
Calcium	mg/L	NC	NA	46	NA		45.9	54	57	51	68	45.9	32.6
Chloride	mg/L	250*	NA	43	NA		14.9	17	15	18	17	3.32	< 1.00
Fluoride	ug/L	4,000	NA	1,000	NA		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	250*	NA	14	NA		35.6	46	83	67	58	45.9	11.8
Total Dissolved Solids	mg/L	500*	NA	258	NA		244	270	310	300	430	230	140
pH, Field	SU	6.5 - 8.5*	NA	4.8 - 9.2	NA		7.7	7.2	7.3	7.3	7.3	7.3	7.2
Appendix IV													
Antimony	ug/L	6	NA	2	6		< 1.0	< 1.0	< 1.0	1.0	2.7	< 1	1
Arsenic	ug/L	10	NA	1	10		< 1.0	1.2	< 1.0	1.4	< 1.0	< 1	< 1
Barium	ug/L	2,000	NA	35	2,000		79.5	96	110	130	130	108	53
Beryllium	ug/L	4	NA	1	4		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1
Cadmium	ug/L	5	NA	0.2	5		< 0.20	< 0.20	< 0.20	< 0.20	0.24	< 0.2	< 0.2
Chromium	ug/L	100	NA	2	100		< 1.0	1.1	< 1.0	< 1.0	< 1.0	< 1	1
Cobalt	ug/L	NC	6	15	15		< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 15	< 15
Fluoride	ug/L	4,000	NA	1,000	4,000		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	15	1	15		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1
Lithium	ug/L	NC	40	10	40		< 10	< 10	< 10	12	< 10	< 10	< 10
Mercury	ug/L	2	NA	0.2	2		< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.2	< 0.2
Molybdenum	ug/L	NC	100	5	**100**		12.4	11	10	13	15	15	20
Radium-226	pCi/L	NC	NA	NA	NA		0.631	0.125	0.144	< 0.195	0.198	< 0.105	< 0.323
Radium-228	pCi/L	NC	NA	NA	NA		< 0.711	< 0.356	< 0.610	< 0.607	< 0.413	< 0.415	< 0.501
Radium-226/228	pCi/L	5	NA	1.93	5		< 1.30	0.428	< 0.610	< 0.607	< 0.413	< 0.415	< 0.501
Selenium	ug/L	50	NA	5	**50**		18.3	30	26	23	31	**57**	12
Thallium	ug/L	2	NA	2	2		< 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. GWPS is the higher of the MCL/RSL and UTL as established in TRC's Technical Memorandum dated October 15, 2018.
* - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April 2012.
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Table C1
Comparison of Groundwater Sampling Results to Groundwater Protection Standards for Statistical Evaluation
JH Campbell Ponds 3N/3S – RCRA CCR Monitoring Program
West Olive, Michigan

						Sample Location:	JHC-MW-18003								
						Sample Date:	12/7/2018	3/12/2019	3/12/2019	4/25/2019	8/13/2019	8/13/2019	10/10/2019	4/15/2020	10/22/2020
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS										
Appendix III									Field Dup			Field Dup			
Boron	ug/L	NC	NA	51	NA		197	210	220	270	330	340	510	283	310
Calcium	mg/L	NC	NA	46	NA		63.6	200	200	160	100	110	140	78.5	75.1
Chloride	mg/L	250*	NA	43	NA		15.3	10	10	11	10	11	10	11.7	3.18
Fluoride	ug/L	4,000	NA	1,000	NA		< 1,000	< 1,000	<1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	250*	NA	14	NA		116	640	630	450	250	250	340	88.9	74.5
Total Dissolved Solids	mg/L	500*	NA	258	NA		326	1,100	1,100	810	510	520	660	352	324
pH, Field	SU	6.5 - 8.5*	NA	4.8 - 9.2	NA		7.4	6.9	--	6.9	7.0	--	6.9	7.2	6.9
Appendix IV															
Antimony	ug/L	6	NA	2	6		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1
Arsenic	ug/L	10	NA	1	10		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	1.4	< 1	< 1
Barium	ug/L	2,000	NA	35	2,000		81.5	150	150	120	100	96	130	97	92
Beryllium	ug/L	4	NA	1	4		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1
Cadmium	ug/L	5	NA	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	2	100		< 1.0	1.1	1.2	< 1.0	< 1.0	< 1.0	< 1.0	< 1	1
Cobalt	ug/L	NC	6	15	15		< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 15	< 15
Fluoride	ug/L	4,000	NA	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	1	15		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1
Lithium	ug/L	NC	40	10	40		< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Mercury	ug/L	2	NA	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	5	**100**		10.9	10	10	12	10	10	12	19	18
Radium-226	pCi/L	NC	NA	NA	NA		< 0.757	0.131	<0.132	0.270	< 0.235	< 0.160	< 0.161	< 0.118	< 0.276
Radium-228	pCi/L	NC	NA	NA	NA		0.833	< 0.497	0.501	0.623	< 0.570	< 0.360	< 0.556	< 0.465	0.405
Radium-226/228	pCi/L	5	NA	1.93	5		< 1.54	< 0.497	0.613	0.892	< 0.570	< 0.360	< 0.556	< 0.465	0.557
Selenium	ug/L	50	NA	5	**50**		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	4	1
Thallium	ug/L	2	NA	2	2		< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2	< 2

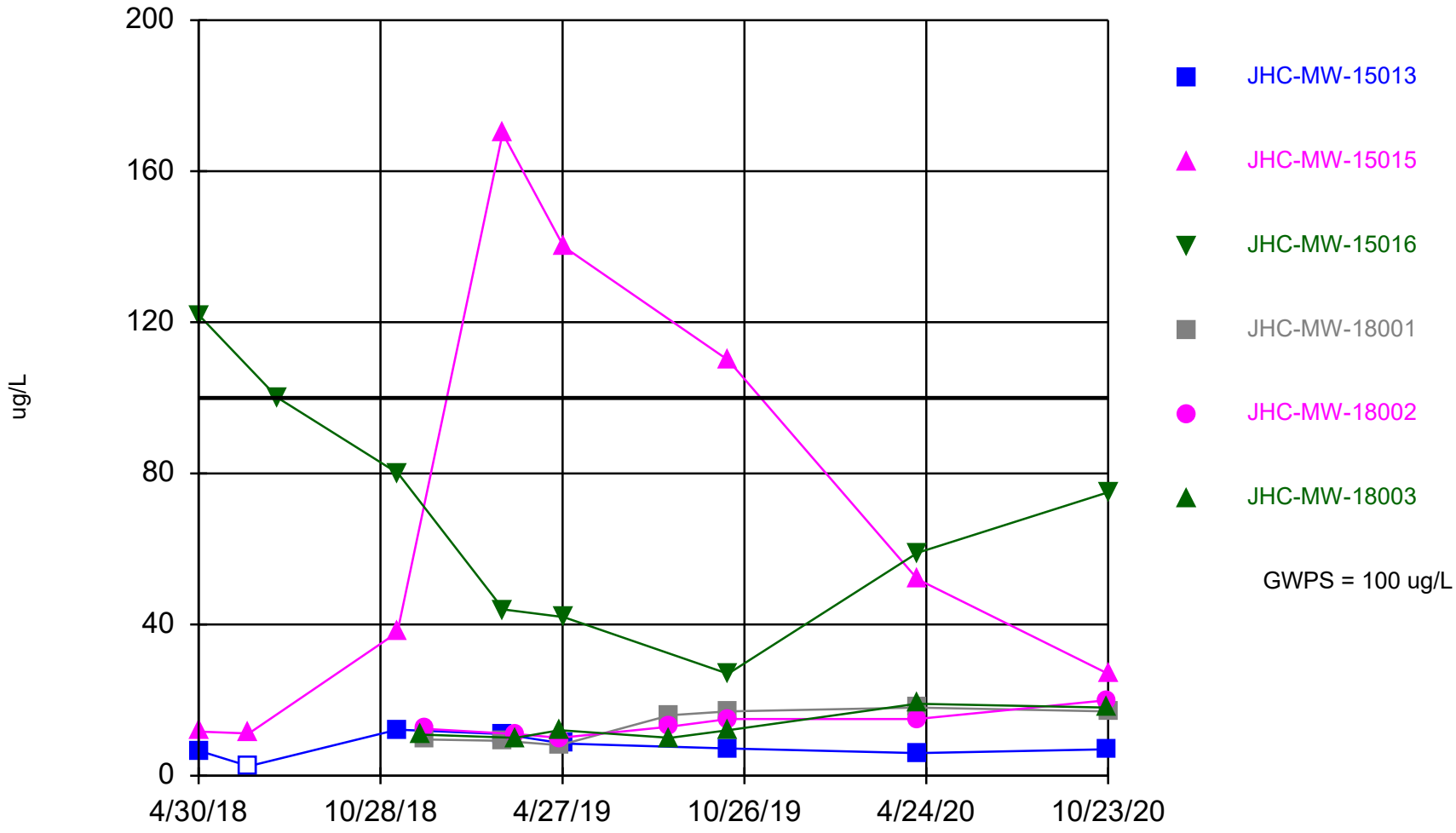
Notes:

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. GWPS is the higher of the MCL/RSL and UTL as established in TRC's Technical Memorandum dated October 15, 2018.
* - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April 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) Field meter reading not usable due to malfunctioning groundwater meter. Displayed value is lab pH reading from an unpreserved bottle.
(2) Monitoring wells JHC-MW-15015 and JHC-MW-15016 have been upgradient of Pond 3 since 2018 due to post-pond decommissioning groundwater flow direction changes and are no longer considered downgradient monitoring wells.

Attachment 1
Sanitas™ Output

Hollow symbols indicate censored values.

Molybdenum Comparison to GWPS

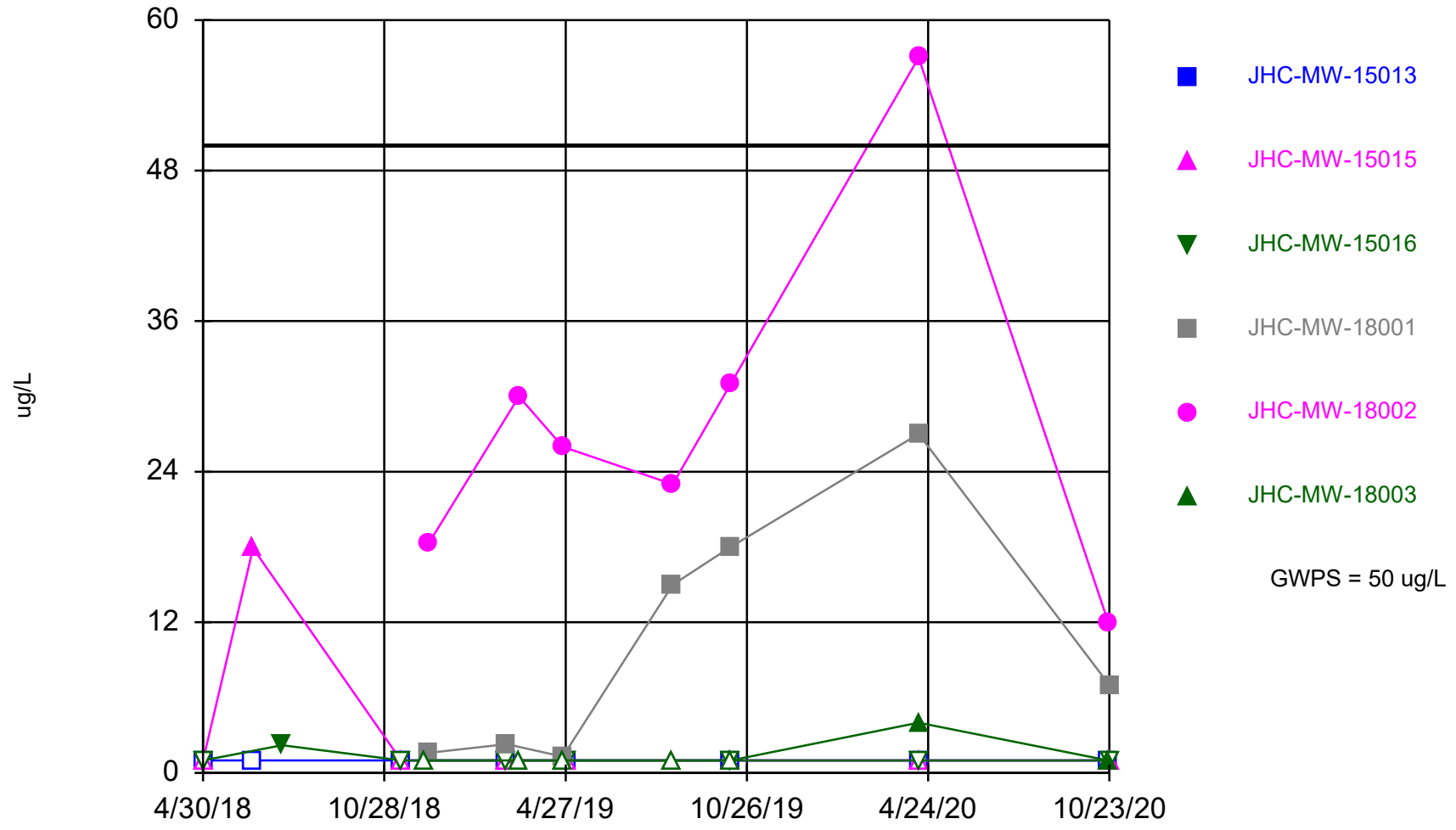


Time Series Analysis Run 12/3/2020 11:15 AM

Client: Consumers Energy Data: JHC_CCR_BG_Ponds123_LF_20.11.30

Hollow symbols indicate censored values.

Selenium Comparison to GWPS



Time Series Analysis Run 12/3/2020 11:16 AM

Client: Consumers Energy Data: JHC_CCR_BG_Ponds123_LF_20.11.30

Summary Report

Constituent: Molybdenum, Total Analysis Run 12/3/2020 11:19 AM
Client: Consumers Energy Data: JHC_CCR_BG_Ponds123_LF_20.11.30

For observations made between 4/30/2018 and 10/23/2020, a summary of the selected data set:

Observations = 45
ND/Trace = 1
Wells = 6
Minimum Value = 5
Maximum Value = 170
Mean Value = 32.34
Median Value = 15
Standard Deviation = 39.34
Coefficient of Variation = 1.216
Skewness = 1.991

Well	#Obs.	ND/Trace	Min	Max	Mean	Median	Std.Dev.	CV	Skewness
JHC-MW-15013	8	1	5	12.2	7.938	7.1	2.492	0.3139	0.6921
JHC-MW-15015	8	0	11.2	170	69.98	44.95	61.6	0.8803	0.581
JHC-MW-15016	8	0	27	122	68.63	67	31.95	0.4655	0.3647
JHC-MW-18001	7	0	8.1	18	13.56	16	4.356	0.3213	-0.2686
JHC-MW-18002	7	0	10	20	13.77	13	3.322	0.2412	0.8223
JHC-MW-18003	7	0	10	19	13.13	12	3.77	0.2872	0.8156

Summary Report

Constituent: Selenium, Total Analysis Run 12/3/2020 11:19 AM
Client: Consumers Energy Data: JHC_CCR_BG_Ponds123_LF_20.11.30

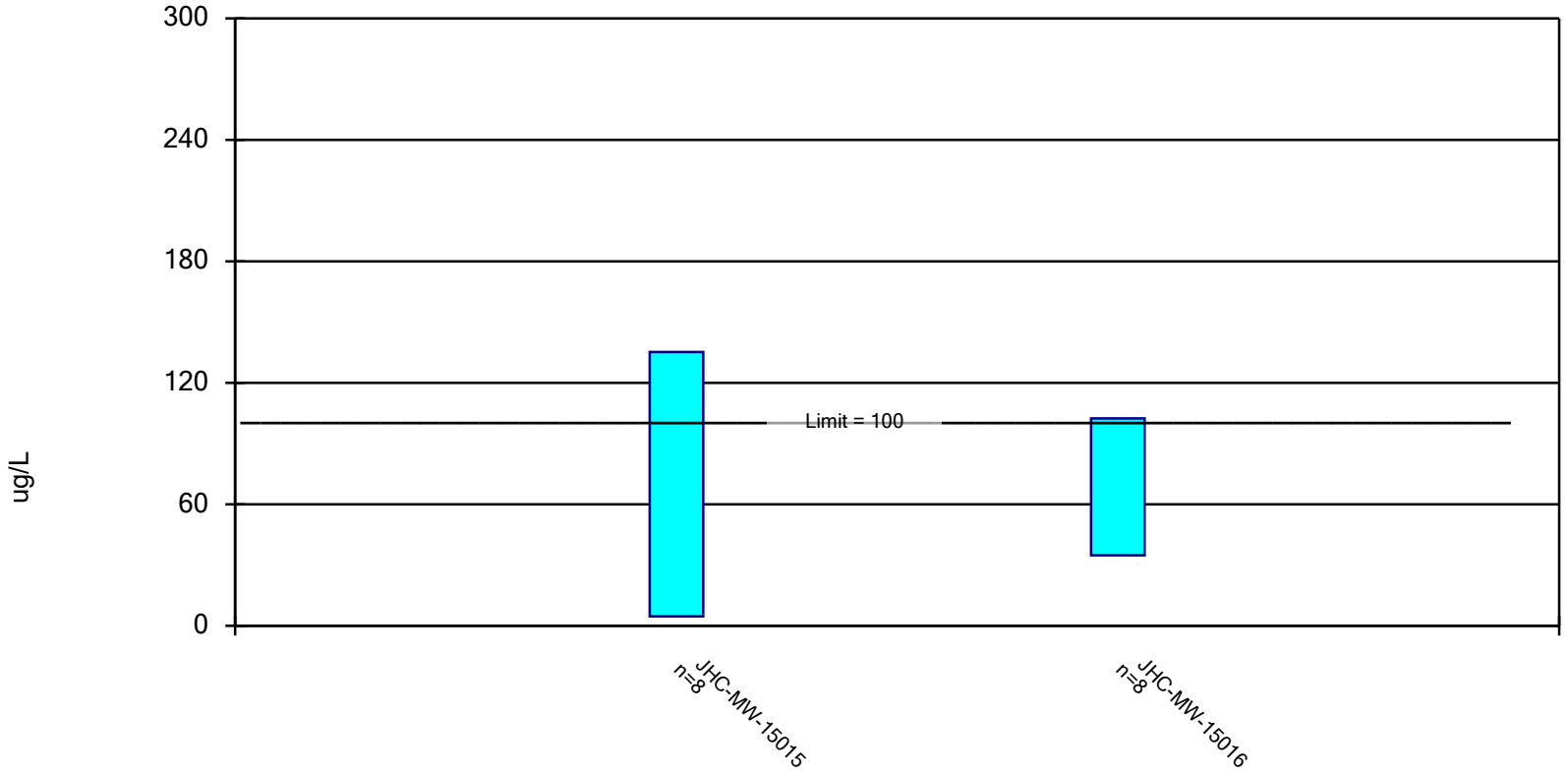
For observations made between 4/30/2018 and 10/23/2020, a summary of the selected data set:

Observations = 45
ND/Trace = 27
Wells = 6
Minimum Value = 1
Maximum Value = 57
Mean Value = 7.147
Median Value = 1
Standard Deviation = 11.87
Coefficient of Variation = 1.661
Skewness = 2.271

Well	#Obs.	ND/Trace	Min	Max	Mean	Median	Std.Dev.	CV	Skewness
JHC-MW-15013	8	8	1	1	1	1	0	0	NaN
JHC-MW-15015	8	7	1	17.9	3.113	1	5.975	1.92	2.268
JHC-MW-15016	8	7	1	2.2	1.15	1	0.4243	0.3689	2.268
JHC-MW-18001	7	0	1.3	27	10.31	7	9.932	0.9629	0.5985
JHC-MW-18002	7	0	12	57	28.19	26	14.33	0.5086	1.137
JHC-MW-18003	7	5	1	4	1.429	1	1.134	0.7937	2.041

Parametric Confidence Interval

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



Constituent: Molybdenum, Total Analysis Run 12/3/2020 11:19 AM

Client: Consumers Energy Data: JHC_CCR_BG_Ponds123_LF_20.11.30

Confidence Interval

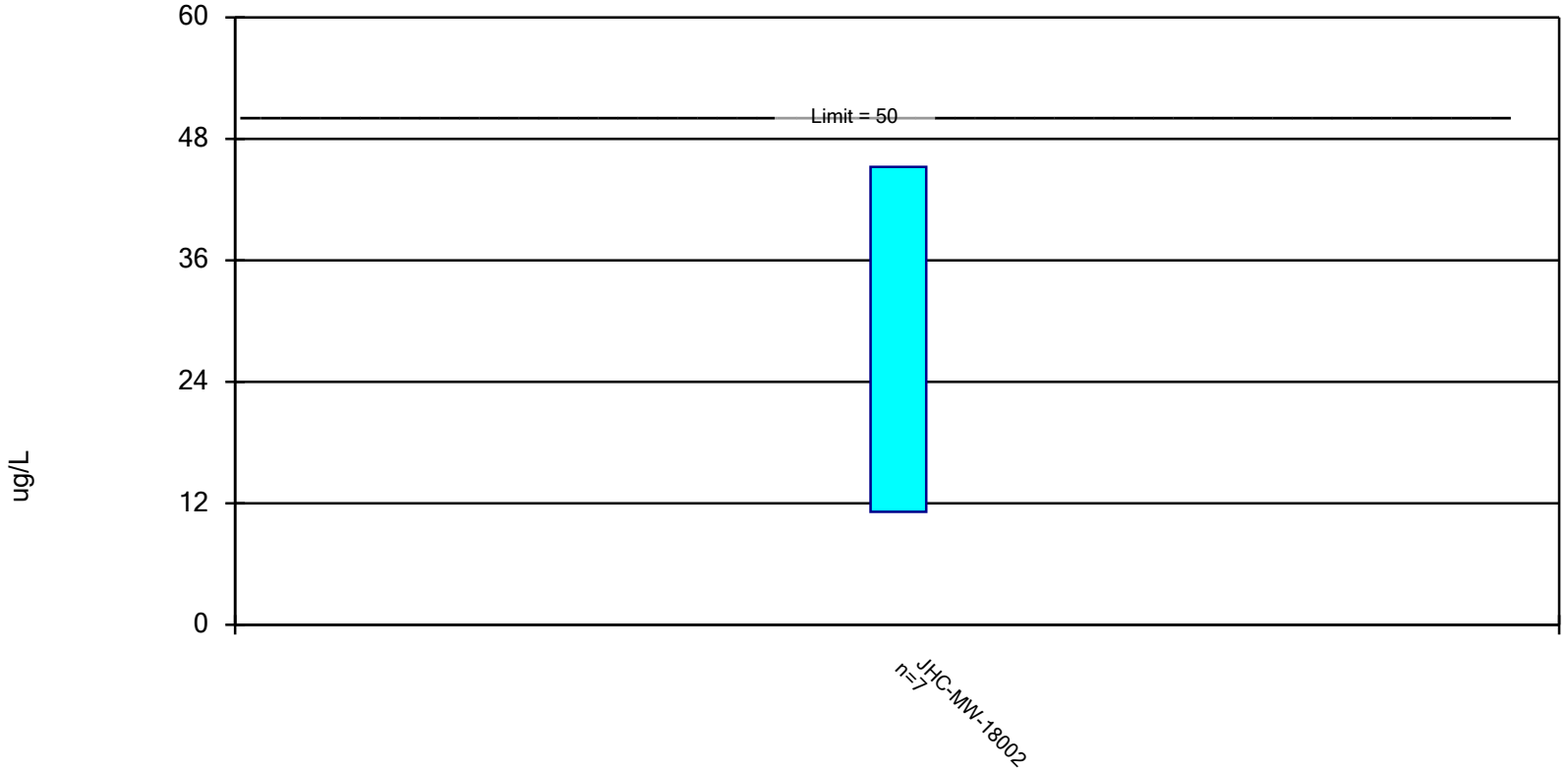
Constituent: Molybdenum, Total (ug/L) Analysis Run 12/3/2020 11:19 AM

Client: Consumers Energy Data: JHC_CCR_BG_Ponds123_LF_20.11.30

	JHC-MW-15015	JHC-MW-15016
4/30/2018	11.7	122
6/19/2018	11.2	
7/18/2018		100
11/14/2018	37.9	
11/15/2018		80
2/27/2019	170	
2/28/2019		44
4/29/2019	140	42
10/10/2019	110	27
4/16/2020	52	59
10/23/2020	27	75
Mean	69.98	68.63
Std. Dev.	61.6	31.95
Upper Lim.	135.3	102.5
Lower Lim.	4.685	34.76

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 11:19 AM

Client: Consumers Energy Data: JHC_CCR_BG_Ponds123_LF_20.11.30

Confidence Interval

Constituent: Selenium, Total (ug/L) Analysis Run 12/3/2020 11:19 AM

Client: Consumers Energy Data: JHC_CCR_BG_Ponds123_LF_20.11.30

	JHC-MW-18002
12/12/2018	18.3
3/12/2019	30
4/25/2019	26
8/13/2019	23
10/10/2019	31
4/15/2020	57
10/22/2020	12
Mean	28.19
Std. Dev.	14.33
Upper Lim.	45.21
Lower Lim.	11.16