2022 Annual Groundwater Monitoring and Corrective Action Report

JH Campbell Power Plant
Dry Ash Landfill

West Olive, Michigan

January 2023

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Executive Summary

On behalf of Consumers Energy, TRC has prepared this report for the JH Campbell Dry Ash Landfill to cover the period of January 1, 2022 to December 31, 2022 and document the status of groundwater monitoring and corrective action for 2022 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, Dry Ash Landfill*. The statistical evaluation of the Appendix III indicator parameters confirming SSIs over background were as follows:

- Boron at JHC-MW-15017, JHC-MW-15018, JHC-MW-15019, JHC-MW-15020, JHC-MW-15021, JHC-MW-15022, JHC-MW-15031, JHC-MW-15032, JHC-MW-15035, and JHC-MW-15037;
- Calcium at JHC-MW-15018, JHC-MW-15019, JHC-MW-15020, JHC-MW-15022, JHC-MW-15031, JHC-MW-15035, and JHC-MW-15037;
- Chloride at JHC-MW-15017, JHC-MW-15020, JHC-MW-15031;
- Sulfate at JHC-MW-15017, JHC-MW-15018, JHC-MW-15019, JHC-MW-15020, JHC-MW-15021, JHC-MW-15022, JHC-MW-15031, JHC-MW-15035, JHC-MW-15036, and JHC-MW-15037; and
- Total dissolved solids (TDS) at JHC-MW-15017, JHC-MW-15018, JHC-MW-15019, JHC-MW-15020, JHC-MW-15021, JHC-MW-15022, JHC-MW-15031, JHC-MW-15035, JHC-MW-15036, and JHC-MW-15037.

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 subsequent semiannual statistical evaluations performed to date, including those in the 2022 reporting period, have shown that no Appendix IV constituents are 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 2023.

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) Dry Ash Landfill at the JH Campbell Power Plant Site (Dry Ash Landfill). 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 2022 activities at the Dry Ash Landfill from January 1, 2022 to December 31, 2022. The Dry Ash Landfill was in assessment monitoring at the beginning and at the end of the period covered by this report. Data that have been collected and evaluated in 2022 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, Dry Ash Landfill 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-15017, JHC-MW-15018, JHC-MW-15019, JHC-MW-15020, JHC-MW-15021, JHC-MW-15022, JHC-MW-15031, JHC-MW-15032, JHC-MW-15035, and JHC-MW-15037;
- Calcium at JHC-MW-15018, JHC-MW-15019, JHC-MW-15020, JHC-MW-15022, JHC-MW-15031, JHC-MW-15035, and JHC-MW-15037;
- Chloride at JHC-MW-15017, JHC-MW-15020, JHC-MW-15031;
- Sulfate at JHC-MW-15017, JHC-MW-15018, JHC-MW-15019, JHC-MW-15020, JHC-MW-15021, JHC-MW-15022, JHC-MW-15031, JHC-MW-15035, JHC-MW-15036, and JHC-MW-15037; and
- Total dissolved solids (TDS) at JHC-MW-15017, JHC-MW-15018, JHC-MW-15019, JHC-MW-15020, JHC-MW-15021, JHC-MW-15022, JHC-MW-15031, JHC-MW-15035, JHC-MW-15036, and JHC-MW-15037.

As discussed in the *2018 Annual Groundwater Monitoring Report for the JH Campbell Power Plant Dry Ash Landfill CCR Unit* (2018 Annual Report) (TRC, January 2019), upon determining that an Alternate Source Demonstration for the Appendix III constituents was not successful, Consumers Energy initiated an Assessment Monitoring Program for the Dry Ash Landfill on April 25, 2018 pursuant to §257.95 of the CCR Rule. The assessment monitoring program includes sampling and analyzing groundwater within the groundwater monitoring system for all constituents listed in Appendix III and Appendix IV. 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 subsequent assessment monitoring evaluations, including those in the 2022 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 Dry Ash Landfill 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.

In addition to the semiannual assessment monitoring performed in accordance with §257.95, Consumers Energy is also conducting quarterly monitoring in accordance with the Michigan Department of Environment, Great Lakes, and Energy (EGLE)[1]-approved *Dry Ash Landfill Hydrogeological Monitoring Plan* (HMP) (TRC, October 2020, Revised November 2021). Quarterly monitoring results are reported under a separate cover in accordance with the requirements of the Michigan Natural Resources and Environmental Protection Act (NREPA), also known as Part 115 of PA 451 of 1994, as amended (a.k.a., Michigan Part 115 Solid Waste Management) and the HMP. Assessment monitoring data that has been collected and evaluated in 2022 in accordance with the CCR Rule 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.

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 is managed in the licensed Dry Ash Landfill which is regulated under Part 115 of the NREPA, PA 451 of 1994, as amended, and monitored in adherence to the facility's HMP.

Bottom ash is currently sluiced to concrete tanks where it is dewatered. The settled and dewatered bottom ash is beneficially reused or managed at the Dry Ash Landfill. The facility consists of the existing CCR landfill Cells 1 through 6. Dry ash from all generating units is stored in silos until it is placed into the facility or is sold and shipped off site. At this time, the north faces of Cells 1 and 2 and the majority of the eastern half of Cell 2 have been closed

[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.

along with Cell 3. Partial cover has been constructed over Cell 4. Cell 5 was constructed in 2018 and put into service in 2019. Cell 6 was constructed in 2021 and put into service in 2022.

This report focuses on the Dry Ash Landfill.

1.3 Geology/Hydrogeology

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

2.0 Groundwater Monitoring

2.1 Monitoring Well Network

In accordance with 40 CFR 257.91, Consumers Energy established a groundwater monitoring system for the JHC Dry Ash Landfill, which currently consists of 14 monitoring wells (6 background monitoring wells and 8 downgradient monitoring wells) that are screened in the uppermost aquifer. The monitoring well locations are shown on Figure 2. Six monitoring wells located north-northwest of the Dry Ash Landfill provide data on background groundwater quality that has not been affected by CCR management at the site (JHC-MW-15023 through JHC-MW-15028). Background groundwater quality data from these six background wells are additionally used for the CCR groundwater monitoring program at three other JH Campbell CCR units.

As described in the *2021 Annual Groundwater Monitoring Report, Consumers Energy, JH Campbell Site, Dry Ash Landfill CCR Unit* (2021 Annual Report) (TRC, January 2022), the compliance well network at the Dry Ash Landfill CCR Unit previously included of eleven downgradient monitoring wells (JHC-MW-15017 through JHC-MW-15019, JHC-MW-15022, and JHC-MW-15031 through JHC-MW-15037) located on the south and east perimeters of the landfill Cells 1 through 4. In 2021, the HMP was prepared under the Michigan Part 115 Solid Waste Management Rules, as amended, and approved by the EGLE on November 30, 2021. The HMP established an updated compliance monitoring network at the Dry Ash Landfill consisting of eight monitoring wells (JHC-MW-15017, JHC-MW-15018, JHC-MW-15031, JHC-MW-15035 through JHC-MW-15037, MW-B3, and MW-B4) located on the south perimeter of the landfill Cells 1 through 6 and removing several side gradient wells along the east perimeter. MW-B3 and MW-B4 were incorporated into the network to monitor groundwater downgradient from Cell 5 and Cell 6. Monitoring well JHC-MW-15019 was located in the footprint of Cell 6 and was decommissioned to accommodate the construction of Cell 6. Several wells along the eastern edge of the landfill (JHC-MW-15022, JHC-MW-15032, JHC-MW-15033, and JHC-MW-15034) were removed from the monitoring network; since these wells are hydraulically side gradient of the landfill, they are not representative of groundwater quality passing beneath the landfill. Static water level data will continue to be measured from JHC-15032 and JHC-MW-15034 to characterize groundwater flow direction along the east edge of the landfill. An updated groundwater monitoring network certification dated July 25, 2022 is included as Appendix A.

As shown on Figure 2, monitoring wells JHC-MW-15029, JHC-MW-15030, JHC-MW-15032, and JHC-MW-5034 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.

2.2 Semiannual Groundwater Monitoring

Per §257.95, all wells in the CCR unit monitoring program must be sampled at least semiannually. One semiannual event must include analysis for all constituents from Appendix III and Appendix IV constituents and one semiannual event may include analysis for 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 HMP which also includes an updated sample and analysis plan (SAP) used for the semiannual assessment monitoring program in accordance with §257.95 of the CCR Rule.

2.2.1 Data Summary

The first semiannual groundwater assessment monitoring event for 2022 was performed on April 11 through 14, 2022 and the second semiannual groundwater assessment monitoring event for 2021 was performed on October 17 through 20, 2022. Both events were performed by Consumers Energy, and samples were analyzed by Consumers Energy Laboratory Services in Jackson, Michigan, with radium samples analyzed by Eurofins Environmental Testing in St Louis, Missouri in accordance with the SAP. Static water elevation data were collected at all monitoring well locations. Groundwater samples were collected from the background monitoring wells and the Dry Ash Landfill monitoring wells during both events for the Appendix III and Appendix IV constituents and field parameters.

A summary of the groundwater data collected during the April and October 2022 events are provided on Table 1 (static groundwater elevation data), Table 2 (field data), Table 3 (background analytical results), and Table 4 (Dry Ash Landfill 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 B.

2.2.3 Groundwater Flow Rate and Direction

Groundwater elevation data collected during the semiannual assessment monitoring events were generally similar to data collected previously in the background, detection monitoring events, and previous assessment monitoring events. The data showed that groundwater within the uppermost aquifer generally flows to the south-southeast across the Site, with a southwesterly groundwater flow component on the western edge of the Site.

Groundwater elevations measured across the Site during the April and October 2022 events are provided on Table 1. April 2022 and October 2022 groundwater elevations were used to construct the groundwater contour maps provided on Figure 3 and Figure 4, respectively. The average hydraulic gradient for each sampling event was calculated using the following well pairs: JHC-MW-15026/PZ-23S, MW-15017/PZ-24S, and JHC-MW-15024/JHC-MW-15031 (Figure 2). The average hydraulic gradient was 0.0035 ft/ft in April 2022 and 0.0035 ft/ft in October 2022. 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 0.54 ft/day or 200 ft/year for the April 2022 event, and approximately 0.55 ft/day or 200 ft/year for the October 2022 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 the Dry Ash Landfill.

3.0 Statistical Evaluation

Assessment monitoring is continuing at the Dry Ash Landfill in accordance with §257.95. The following section summarizes the statistical approach applied to assess the 2022 groundwater data in accordance with the assessment monitoring program. The statistical evaluation details are provided in Appendix C (*Statistical Evaluation of April 2022 Assessment Monitoring Sampling Event*) and Appendix D (*Statistical Evaluation of October 2022 Assessment Monitoring Sampling Event)*.

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.

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 *2021 Annual Groundwater Monitoring Report, Consumers Energy, JH Campbell Site, Dry Ash Landfill CCR Unit* (2021 Annual Report) (TRC, January 2022), the statistical data comparison for the 2021 semiannual assessment monitoring events indicated that no Appendix IV constituents were present at statistically significant levels exceeding the GWPSs. Therefore, assessment monitoring continued in 2022.

From the initiation of assessment monitoring in April 2018 through the April 2022 sampling event, no parameter-well combinations included a direct exceedance of the GWPS. Therefore, no confidence limits were calculated for the Dry Ash Landfill following the April 2022 sampling event. During the October 2022 sampling event, antimony was detected above the GWPS in one downgradient well; however, the lower confidence level remained below the GWPS and no corrective actions were triggered. A summary of the confidence intervals for October 2022 are provided in Table 5.

Per §257.95(e), Consumers Energy can return to detection monitoring at the Dry Ash Landfill 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 in 2022 per §257.95(d).

4.0 Corrective Action

There were no corrective actions needed or performed for the Dry Ash Landfill within the calendar year 2022. 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 the Dry Ash Landfill 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 groundwater monitoring system wells and analyzed for Appendix III and Appendix IV constituents pursuant to §257.95(d). The semiannual assessment monitoring analysis completed to-date, as of the writing of this report, indicate that no Appendix IV constituents are present at statistically significant levels exceeding the GWPSs. Therefore, Consumers Energy has continued semiannual assessment monitoring at the Dry Ash Landfill.

Per §257.95(e), Consumers Energy can return to detection monitoring at the Dry Ash Landfill 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 in 2023 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 tentatively scheduled for the second and fourth calendar quarter of 2023.

6.0 References

TRC. October 2017. Groundwater Statistical Evaluation Plan – JH Campbell Power Plant, Dry Ash Landfill, West Olive, Michigan. Prepared for Consumers Energy Company.

TRC. January 2018. Annual Groundwater Monitoring Report, Consumers Energy, JH Campbell Site, Dry Ash Landfill CCR Unit, West Olive, Michigan. Prepared for Consumers Energy Company.

TRC. January 2019. 2018 Annual Groundwater Monitoring Report, Consumers Energy, JH Campbell Site, Dry Ash Landfill CCR Unit, West Olive, Michigan. Prepared for Consumers Energy Company.

TRC. January 2020. 2019 Annual Groundwater Monitoring Report, Consumers Energy, JH Campbell Site, Dry Ash Landfill CCR Unit, West Olive, Michigan. Prepared for Consumers Energy Company.

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TRC. January 2022. 2021 Annual Groundwater Monitoring Report, Consumers Energy, JH Campbell Site, Dry Ash Landfill CCR Unit, West Olive, Michigan. Prepared for Consumers Energy Company.

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

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 2022
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 11, 2022		October 17, 2022	
							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	17.61	602.37	19.25	600.73
JHC-MW-15024	613.79	616.62	Sand	606.8	to	596.8	13.39	603.23	14.58	602.04
JHC-MW-15025	614.14	617.17	Sand	607.1	to	597.1	12.78	604.39	13.85	603.32
JHC-MW-15026	615.09	618.04	Sand	607.1	to	597.1	14.86	603.18	15.57	602.47
JHC-MW-15027	614.77	617.30	Sand	604.8	to	594.8	15.49	601.81	16.08	601.22
JHC-MW-15028	611.02	613.80	Sand	603.0	to	593.0	16.70	597.10	15.27	598.53
JHC-MW-15029	608.08	610.95	Sand	600.1	to	590.1	12.39	598.56	12.32	598.63
JHC-MW-15030	604.05	607.17	Sand	600.1	to	590.1	9.91	597.26	10.50	596.67
Pond 1N, 1S, 2N, 2S										
JHC-MW-15001	607.02	609.53	Sand	603.5	to	598.5	--		NM	
JHC-MW-15002	618.18	621.27	Sand	590.2	to	580.2	25.40	595.87	25.28	595.99
JHC-MW-15003	623.16	627.20	Sand	595.2	to	585.2	33.40	593.80	33.40	593.80
JHC-MW-15005	606.22	609.99	Sand	579.2	to	569.2	18.39	591.60	18.48	591.51
JHC-MW-18004	602.92	605.72	Sand	596.9	to	586.9	12.00	593.72	12.48	593.24
JHC-MW-18005	600.30	603.16	Sand	595.3	to	585.3	10.63	592.53	11.01	592.15
JHC-MW-22001	601.52	604.28	Sand	596.5	to	586.5			11.70	592.58
Pond 3N, 3S										
JHC-MW-15013	632.40	635.25	Sand	604.4	to	594.4	36.45	598.80	36.16	599.09
JHC-MW-15015	632.46	635.20	Sand	604.5	to	594.5	36.14	599.06	35.85	599.35
JHC-MW-15016	631.81	632.52	Sand	603.8	to	593.8	33.51	599.01	33.42	599.10
JHC-MW-18001	609.09	611.98	Sand	603.1	to	593.1	13.26	598.72	12.98	599.00
JHC-MW-18002	605.53	608.93	Sand	602.0	to	592.0	9.85	599.08	9.55	599.38
JHC-MW-18003	605.36	608.78	Sand	601.9	to	591.9	9.79	598.99	9.65	599.13
Landfill										
JHC-MW-15017	613.69	616.61	Sand	603.7	to	593.7	16.54	600.07	16.83	599.78
JHC-MW-15018	614.26	617.02	Sand	604.3	to	594.3	17.30	599.72	17.52	599.50
JHC-MW-15022	620.92	623.79	Sand	597.9	to	587.9	--		NM	
JHC-MW-15031	632.94	635.87	Sand	599.9	to	589.9	43.71	592.16	43.90	591.97
JHC-MW-15032	611.32	614.29	Sand	598.3	to	588.3	16.76	597.53	18.14	596.15
JHC-MW-15033	618.08	620.99	Sand	602.1	to	592.1	--		NM	
JHC-MW-15034	612.90	615.97	Sand	601.9	to	591.9	15.50	600.47	17.19	598.78
JHC-MW-15035	632.53	634.28	Sand	599.5	to	589.5	41.37	592.91	41.45	592.83
JHC-MW-15036	617.94	618.34	Sand	597.9	to	587.9	26.95	591.39	27.35	590.99
JHC-MW-15037	614.28	616.06	Sand	591.3	to	586.3	25.17	590.89	25.60	590.46
MW-B3	630.51	634.17	Sand	598.5	to	593.5	39.06	595.11	39.90	594.27
MW-B4	633.80	635.67	Sand	593.8	to	588.8	41.81	593.86	41.77	593.90
Pond A										
JHC-MW-15006	624.74	627.58	Sand	599.7	to	589.7	35.08	592.50	36.05	591.53
JHC-MW-15007R[(2)]	625.73	628.26	Sand	595.7	to	585.7	36.01	592.25	37.18	591.08
JHC-MW-15008R[(1)]	632.32	634.67	Sand	597.3	to	587.3	42.95	591.72	44.05	590.62
JHC-MW-15009R[(2)]	632.15	635.05	Sand	595.2	to	585.2	43.29	591.76	44.01	591.04
JHC-MW-15011R[(2)]	627.73	629.79	Sand	594.7	to	584.7	37.50	592.29	38.31	591.48
Downgradient Wells										
MW-13	593.40	595.37	Clayey Silt	587.9	to	585.4	DRY		NM	
MW-14S	587.36	590.98	Sand	582.9	to	577.9	10.32	580.66	10.51	580.47
PZ-23S	602.84	604.97	Sand	591.8	to	586.8	13.29	591.68	15.59	589.38
PZ-24S	586.56	590.15	Sand	584.6	to	579.6	7.17	582.98	8.90	581.25
PZ-40S	589.51	593.25	Sand	585.5	to	575.5	10.02	583.23	12.48	580.77
TW-19-05	603.44	606.36	Sand	592.8	to	587.8	15.41	590.95	17.15	589.21
TW-19-06A	599.61	602.54	Sand	592.3	to	587.3	12.52	590.02	14.21	588.33

Notes:
Survey conducted by Nederveld, November 2015, October 2018, December 2018, August 2019, and July 2021.
Elevation in feet relative to North American Vertical Datum 1988 (NAVD 88).
TOC: Top of well casing.
ft BTOC: Feet below top of well casing.
--: Not measured
(1) JHC-MW-15008R installed in June 2019.
(2) JHC-MW-15007R, JHC-MW-15009R, and JHC-MW-15011R installed in July 2021.

Table 2

Summary of Field Parameter Results - April - October 2022
JH Campbell Dry Ash Landfill - 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	4/12/2022	2.38	182.9	5.5	119	11.2	2.1
	10/18/2022	3.00	275.2	5.7	60	9.4	2.1
JHC-MW-15024	4/12/2022	1.47	100.2	7.4	418	10.7	2.6
	10/18/2022	0.52	207.4	7.8	372	10.0	3.7
JHC-MW-15025	4/11/2022	3.70	144.8	7.9	254	8.0	2.9
	10/18/2022	0.82	89.7	8.1	323	10.0	2.1
JHC-MW-15026	4/11/2022	2.56	172.0	5.9	43	10.2	2.2
	10/18/2022	2.33	283.7	5.9	41	12.2	3.0
JHC-MW-15027	4/11/2022	7.08	192.7	6.2	141	9.8	5.2
	10/18/2022	4.78	263.6	6.3	166	12.4	5.7
JHC-MW-15028	4/12/2022	4.64	107.9	8.5	153	12.8	1.8
	10/18/2022	3.90	132.0	8.5	155	12.2	3.2
Dry Ash Landfill							
JHC-MW-15017	4/12/2022	0.79	125.0	7.7	520	14.0	0.0
	10/20/2022	0.97	96.1	6.4	546	11.7	4.8
JHC-MW-15018	4/13/2022	2.39	147.0	5.9	515	13.7	0.0
	10/20/2022	0.91	119.9	5.9	531	12.4	3.4
JHC-MW-15031	4/12/2022	2.70	128.9	7.1	420	13.4	0.0
	10/20/2022	1.51	75.4	7.5	359	12.6	5.9
JHC-MW-15035	4/12/2022	1.86	146.4	7.2	592	14.7	0.0
	10/20/2022	0.57	67.6	7.4	428	13.7	1.8
JHC-MW-15036	4/12/2022	3.97	97.8	7.4	457	14.5	3.2
	10/20/2022	0.84	46.1	7.3	302	11.9	2.5
JHC-MW-15037	4/12/2022	2.48	120.9	7.2	630	13.2	3.8
	10/20/2022	3.47	55.7	6.7	397	11.4	2.0
MW-B3	4/12/2022	3.51	176.7	6.5	628	15.9	0.0
	10/20/2022	1.20	180.4	6.1	456	11.6	1.2
MW-B4	4/12/2022	1.15	154.9	7.2	450	14.7	0.0
	10/20/2022	0.59	90.3	6.9	577	14.0	1.75

Notes:

mg/L - Milligrams per Liter.
mV - Millivolts.
SU - Standard Units.
umhos/cm - Micromhos per centimeter.
°C - Degrees Celsius.
NTU - Nephelometric Turbidity Unit.

Table 3
Summary of Background Groundwater Sampling Results (Analytical) - April - October 2022
JH Campbell Background – RCRA CCR Monitoring Program
West Olive, Michigan

					Sample Location:	JHC-MW-15023		JHC-MW-15024		JHC-MW-15025		JHC-MW-15026		JHC-MW-15027		JHC-MW-15028	
					Sample Date:	4/12/2022	10/18/2022	4/12/2022	10/18/2022	4/11/2022	10/18/2022	4/11/2022	10/18/2022	4/11/2022	10/18/2022	4/12/2022	10/18/2022
Constituent	Unit	EPA MCL	MI Residential*	MI Non-Residential*	MI GSI^	background											
Appendix III[(1)]																	
Boron	ug/L	NC	500	500	7,200	54	36	21	< 20	24	22	< 20	< 20	< 20	< 20	< 20	< 20
Calcium	mg/L	NC	NC	NC	500[EE]	15.3	7.88	42.9	37.7	27.4	25.9	4.65	3.48	16.6	21.6	20.3	20.2
Chloride	mg/L	250**	250[E]	250[E]	500[EE]	5.24	3.22	41.4	27.1	22.7	20.1	1.75	< 1.00	1.76	1.21	< 1.00	< 1.00
Fluoride	ug/L	4,000	NC	NC	NC	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	250**	250[E]	250[E]	500[EE]	16.7	13.4	6.52	7.52	7.52	9.8	5.92	7.89	8.25	7.30	5.80	5.89
Total Dissolved Solids	mg/L	500**	500[E]	500[E]	500	88	76	233	226	145	187	31	44	83	131	80	110
pH, Field	SU	**6.5 - 8.5****	**6.5 - 8.5[E]**	**6.5 - 8.5[E]**	**6.5 - 9.0**	**5.5**	**5.7**	7.4	7.8	7.9	8.1	**5.9**	**5.9**	**6.2**	**6.3**	8.5	8.5
Appendix IV[(1)]																	
Antimony	ug/L	6	6.0	6.0	130	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Arsenic	ug/L	10	10	10	10	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Barium	ug/L	2,000	2,000	2,000	820	49	27	26	22	7	8	12	8	28	20	8	8
Beryllium	ug/L	4	4.0	4.0	18	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Cadmium	ug/L	5	5.0	5.0	3.5	0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium	ug/L	100	100	100	11	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	1	< 1
Cobalt	ug/L	NC	40	100	100	< 6	< 6	< 6	< 6	< 6	< 6	< 6	< 6	< 6	< 6	< 6	< 6
Fluoride	ug/L	4,000	NC	NC	NC	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	4.0	4.0	39	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Lithium	ug/L	NC	170	350	440	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Mercury	ug/L	2	2.0	2.0	0.20[#]	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Molybdenum	ug/L	NC	73	210	3,200	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Radium-226	pCi/L	NC	NC	NC	NC	0.124	0.153	< 0.0963	< 0.124	< 0.0857	< 0.112	< 0.0921	< 0.106	< 0.103	< 0.127	< 0.0996	< 0.103
Radium-228	pCi/L	NC	NC	NC	NC	0.438	0.704	< 0.449	< 0.625	< 0.447	< 0.499	0.465	< 0.504	< 0.378	0.792	< 0.398	< 0.467
Radium-226/228	pCi/L	5	NC	NC	NC	0.562	0.857	< 0.449	< 0.625	< 0.447	< 0.499	0.552	< 0.504	< 0.378	0.822	< 0.398	0.534
Selenium	ug/L	50	50	50	5.0	1	< 1	2	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Thallium	ug/L	2	2.0	2.0	3.7	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2

Notes:

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

Table 4
Summary of Dry Ash Landfill Groundwater Sampling Results (Analytical) - April - October 2022
JH Campbell Dry Ash Landfill – RCRA CCR Monitoring Program
West Olive, Michigan

						Sample Location:	JHC-MW-15017		JHC-MW-15018		JHC-MW-15031		JHC-MW-15035	
						Sample Date:	4/12/2022	10/20/2022	4/13/2022	10/20/2022	4/12/2022	10/20/2022	4/12/2022	10/20/2022
Constituent	Unit	UTL	EPA MCL	MI Residential*	MI Non-Residential*	MI GSI^	downgradient							
Appendix III[(1)]														
Boron	ug/L	51	NC	500	500	7,200	161	163	287	269	58	56	81	59
Calcium	mg/L	46	NC	NC	NC	500[EE]	60.6	61.6	65.9	59.6	59.8	49.6	79.2	64.2
Chloride	mg/L	43	250**	250[E]	250[E]	500[EE]	25.4	24.1	28.8	25.5	10.4	3.28	9.35	7.98
Fluoride	ug/L	1,000	4,000	NC	NC	NC	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	14	250**	250[E]	250[E]	500[EE]	39.2	43.2	58.7	53.6	27.5	16.0	25.7	29.4
Total Dissolved Solids	mg/L	258	500**	500[E]	500[E]	500	276	313	300	316	220	215	320	272
pH, Field	SU	4.8 - 9.2	**6.5 - 8.5****	**6.5 - 8.5[E]**	**6.5 - 8.5[E]**	**6.5 - 9.0**	7.7	**6.4**	**5.9**	**5.9**	7.1	7.5	7.2	7.4
Appendix IV[(1)]														
Antimony	ug/L	2	6	**6.0**	**6.0**	130	< 1	< 1	< 1	< 1	< 1	< 1	< 1	7
Arsenic	ug/L	1	10	10	10	10	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Barium	ug/L	35	2,000	2,000	2,000	820	24	28	45	31	14	12	17	14
Beryllium	ug/L	1	4	4.0	4.0	18	< 1	< 1	< 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	< 0.2	< 0.2
Chromium	ug/L	2	100	100	100	11	2	< 1	< 1	< 1	1	< 1	< 1	< 1
Cobalt	ug/L	15	NC	40	100	100	< 6	< 6	< 6	< 6	< 6	< 6	< 6	< 6
Fluoride	ug/L	1,000	4,000	NC	NC	NC	< 1,000	< 1,000	< 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	< 1	< 1
Lithium	ug/L	10	NC	170	350	440	< 10	< 10	< 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	< 0.2	< 0.2
Molybdenum	ug/L	5	NC	73	210	3,200	< 5	< 5	< 5	6	< 5	< 5	< 5	< 5
Radium-226	pCi/L	NA	NC	NC	NC	NC	0.123	0.102	0.117	0.195	< 0.0858	< 0.0891	< 0.0886	< 0.0969
Radium-228	pCi/L	NA	NC	NC	NC	NC	< 0.376	< 0.627	< 0.337	< 0.560	< 0.456	< 0.576	< 0.378	< 0.450
Radium-226/228	pCi/L	1.93	5	NC	NC	NC	< 0.376	< 0.627	0.343	0.682	< 0.456	< 0.576	< 0.378	< 0.450
Selenium	ug/L	5	50	50	50	**5.0**	**18**	**19**	**18**	**19**	3	2	3	3
Thallium	ug/L	2	2	2.0	2.0	3.7	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2

Notes:
ug/L - micrograms per liter; mg/L - milligrams per liter.
pCi/L - picocuries per liter; SU - standard units; pH is a field parameter.
MCL - Maximum Contaminant Level, EPA Drinking Water Standards and Health Advisories, April, 2012.
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.
NC - no criteria.
* - Michigan Part 201 Generic Drinking Water Cleanup Criteria, December 21, 2020.
** - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April, 2012.
^ - Michigan Part 201 Groundwater Surface Water Interface (GSI) Criteria. Hardness-dependent criteria calculated using site-specific hardness of 180 mg CaCO3/L as measured at surface water sample SW-01 collected on April 9, 2018 from the Pigeon River. Chromium GSI criterion based on hexavalent chromium per footnote {H}.
# - If detected above 0.20 ug/L, further evaluation of low-level mercury may be necessary to evaluate the GSI pathway per Michigan Part 201 and MDEQ policy and procedure 09-014 dated June 20, 2012.
[E] - Criterion is the aesthetic drinking water value per footnote {E}.
[EE] - Criterion is based on the total dissolved solids GSI value per footnote {EE}.
(1) 40 CFR Part 257 Appendix III Detection Monitoring Constituents and Appendix IV Assessment Monitoring Constituents.
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 Dry Ash Landfill Groundwater Sampling Results (Analytical) - April - October 2022
JH Campbell Dry Ash Landfill – RCRA CCR Monitoring Program
West Olive, Michigan

						Sample Location:	**JHC-MW-15036**		**JHC-MW-15037**		**MW-B3**		**MW-B4**	
						Sample Date:	4/12/2022	10/20/2022	4/12/2022	10/20/2022	4/12/2022	10/20/2022	4/12/2022	10/20/2022
Constituent	Unit	UTL	EPA MCL	MI Residential*	MI Non-Residential*	MI GSI^	downgradient							
Appendix III[(1)]														
Boron	ug/L	51	NC	500	500	7,200	94	48	170	118	92	74	178	274
Calcium	mg/L	46	NC	NC	NC	500[EE]	57.6	32.8	85.1	52.3	95.8	70.1	52.5	83.5
Chloride	mg/L	43	250**	250[E]	250[E]	500[EE]	9.20	9.60	6.92	1.78	6.65	24.2	19.6	34.5
Fluoride	ug/L	1,000	4,000	NC	NC	NC	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	14	250**	250[E]	250[E]	500[EE]	19.2	15.3	42.8	24.1	24.1	73.8	18.5	28.9
Total Dissolved Solids	mg/L	258	500**	500[E]	500[E]	500	238	163	359	270	348	383	245	410
pH, Field	SU	4.8 - 9.2	**6.5 - 8.5****	**6.5 - 8.5[E]**	**6.5 - 8.5[E]**	**6.5 - 9.0**	7.4	7.3	7.2	6.7	6.5	**6.1**	7.2	6.9
Appendix IV[(1)]														
Antimony	ug/L	2	**6**	**6.0**	**6.0**	130	< 1	< 1	< 1	< 1	1	< 1	< 1	< 1
Arsenic	ug/L	1	10	10	10	10	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Barium	ug/L	35	2,000	2,000	2,000	820	9	6	18	12	70	69	29	54
Beryllium	ug/L	1	4	4.0	4.0	18	< 1	< 1	< 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	< 0.2	< 0.2
Chromium	ug/L	2	100	100	100	11	< 1	< 1	1	< 1	1	< 1	2	< 1
Cobalt	ug/L	15	NC	40	100	100	< 6	< 6	< 6	< 6	< 6	< 6	< 6	< 6
Fluoride	ug/L	1,000	4,000	NC	NC	NC	< 1,000	< 1,000	< 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	< 1	< 1
Lithium	ug/L	10	NC	170	350	440	< 10	< 10	< 10	< 10	12	12	< 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	< 0.2	< 0.2
Molybdenum	ug/L	5	NC	73	210	3,200	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Radium-226	pCi/L	NA	NC	NC	NC	NC	< 0.0916	< 0.0874	< 0.0845	< 0.114	0.14	0.184	< 0.089	0.202
Radium-228	pCi/L	NA	NC	NC	NC	NC	< 0.395	< 0.616	< 0.312	0.642	0.419	< 0.571	< 0.410	< 0.486
Radium-226/228	pCi/L	1.93	5	NC	NC	NC	< 0.395	< 0.616	< 0.312	0.671	0.558	< 0.571	< 0.410	< 0.486
Selenium	ug/L	5	50	50	50	**5.0**	2	< 1	**19**	4	**29**	**7**	4	2
Thallium	ug/L	2	2	2.0	2.0	3.7	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2

Notes:
ug/L - micrograms per liter; mg/L - milligrams per liter.
pCi/L - picocuries per liter; SU - standard units; pH is a field parameter.
MCL - Maximum Contaminant Level, EPA Drinking Water Standards and Health Advisories, April, 2012.
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.
NC - no criteria.
* - Michigan Part 201 Generic Drinking Water Cleanup Criteria, December 21, 2020.
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^ - Michigan Part 201 Groundwater Surface Water Interface (GSI) Criteria. Hardness-dependent criteria calculated using site-specific hardness of 180 mg CaCO3/L as measured at surface water sample SW-01 collected on April 9, 2018 from the Pigeon River. Chromium GSI criterion based on hexavalent chromium per footnote {H}.
# - If detected above 0.20 ug/L, further evaluation of low-level mercury may be necessary to evaluate the GSI pathway per Michigan Part 201 and MDEQ policy and procedure 09-014 dated June 20, 2012.
E - Criterion is the aesthetic drinking water value per footnote {E}.
EE - Criterion is based on the total dissolved solids GSI value per footnote {EE}.
(1) 40 CFR Part 257 Appendix III Detection Monitoring Constituents and Appendix IV Assessment Monitoring Constituents.
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 – October 2022

JH Campbell Dry Ash Landfill - RCRA CCR Monitoring Program

West Olive, Michigan

Constituent	Units	GWPS	JHC-MW-15035	
			LCL	UCL
Antimony	ug/L	6	1.0	7.0

Notes:

ug/L - micrograms per Liter.

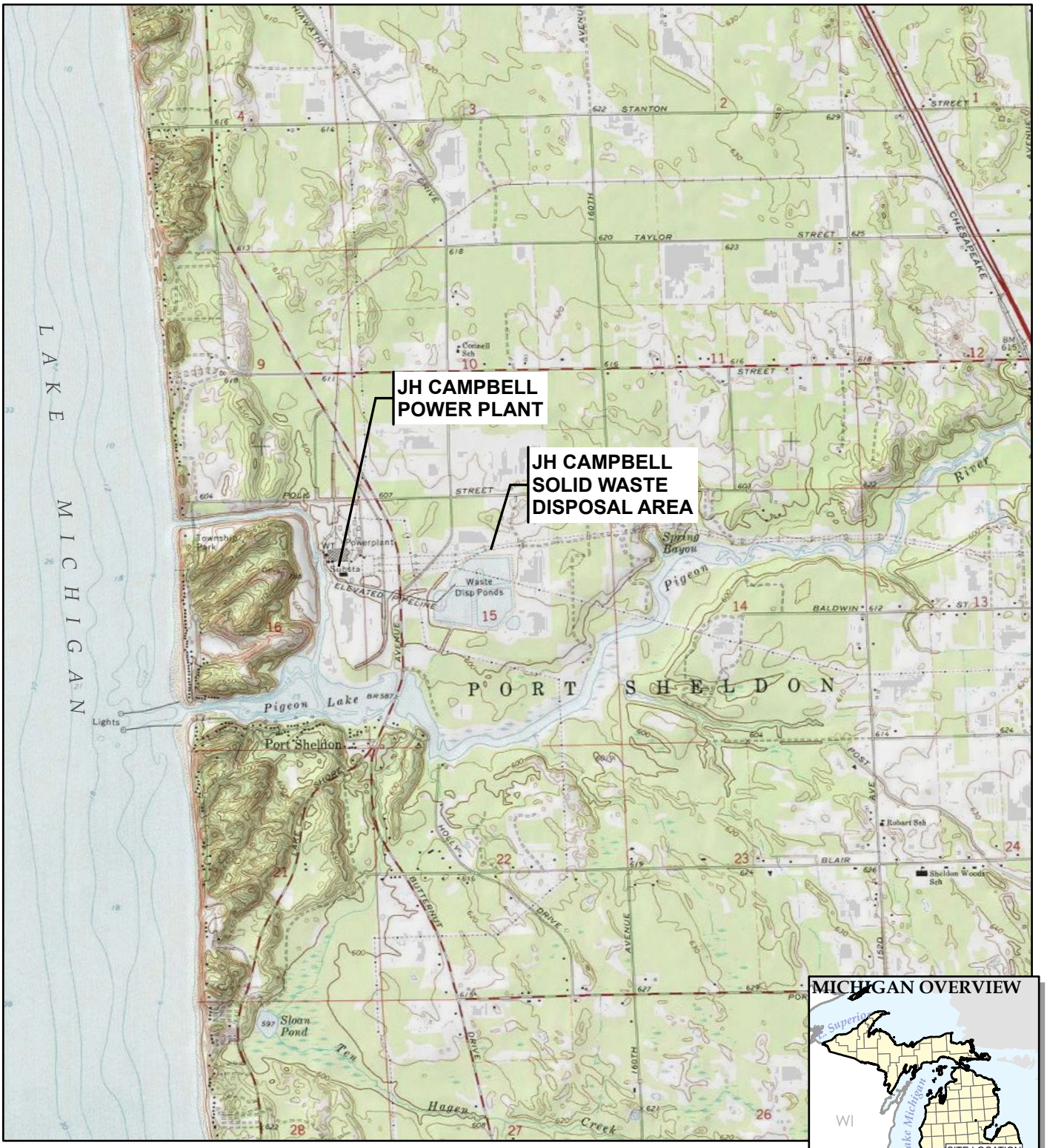
GWPS - Groundwater Protection Standard as established in TRC's Technical Memorandum dated October 15, 2018.

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.

Figures



BASE MAP FROM USGS 7.5 MINUTE TOPOGRAPHIC QUADRANGLE SERIES.

N

1:36,000
1:36,000

0 3,000 6,000 FEET

TRC

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

TRC - GIS

PROJECT:

CONSUMERS ENERGY COMPANY
JH CAMPBELL POWER PLANT
WEST OLIVE, MICHIGAN

TITLE:

SITE LOCATION MAP

DRAWN BY:	A. FOJTIK
CHECKED BY:	H. SCHNAIDT
APPROVED BY:	S. HOLMSTROM
DATE:	JANUARY 2023
PROJ. NO.:	464090.0001
FILE:	464090_JHC.mxd

FIGURE 1

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LEGEND

- BACKGROUND MONITORING WELL
- DOWNGRADIENT BOTTOM ASH POND 3 N/S MONITORING WELL
- DOWNGRADIENT LANDFILL MONITORING WELL
- DOWNGRADIENT POND A MONITORING WELL
- MONITORING WELL (STATIC WATER LEVEL ONLY)
- DECOMMISSIONED
- DOWNGRADIENT BOTTOM ASH POND 1/2 N/S MONITORING WELL (2018)
- DOWNGRADIENT BOTTOM ASH POND 1/2 N/S MONITORING WELL (2022)
- DOWNGRADIENT BOTTOM ASH POND 3 N/S MONITORING WELL (2018)
- NATURE AND EXTENT/DOWNGRADIENT MONITORING WELLS

NOTES:

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

N

1:8,400

1" = 700'

0 500 1,000 FEET

PROJECT:	CONSUMERS ENERGY COMPANY JH CAMPBELL POWER PLANT WEST OLIVE, MICHIGAN
TITLE:	SITE PLAN WITH CCR MONITORING WELL LOCATIONS
DRAWN BY: A. FOJTIK	PROJ. NO.: 464090.0001
CHECKED BY: H. SCHNAIDT	FIGURE 2
APPROVED BY: S. HOLMSTROM	
DATE: JANUARY 2023	

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

FILE: 464090_JHC.aprx

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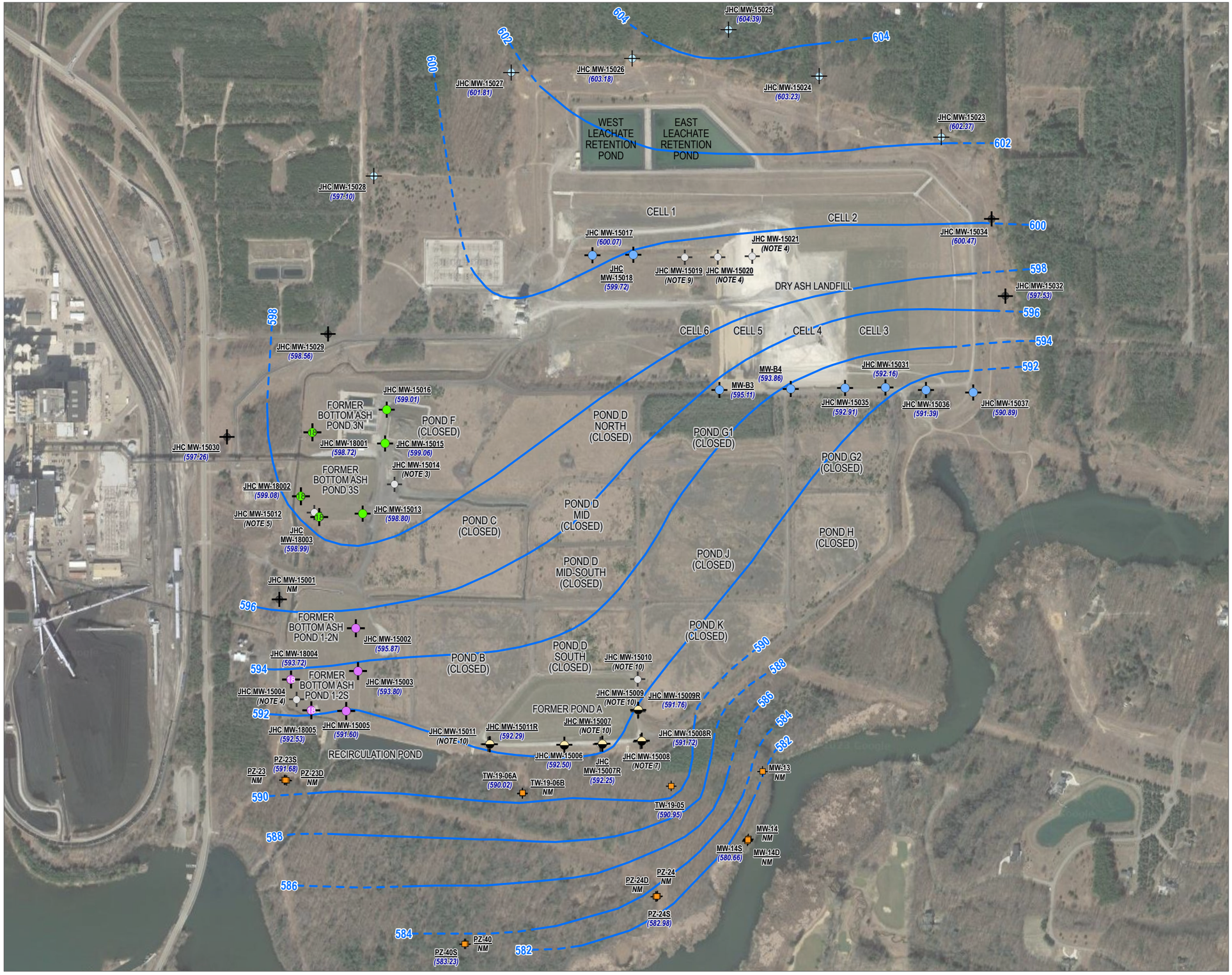

LEGEND

- BACKGROUND MONITORING WELL
- DOWNGRADIENT BOTTOM ASH POND 1/2 N/S MONITORING WELL
- DOWNGRADIENT BOTTOM ASH POND 3 N/S MONITORING WELL
- DOWNGRADIENT LANDFILL MONITORING WELL
- DOWNGRADIENT POND A MONITORING WELL
- MONITORING WELL (STATIC WATER LEVEL ONLY)
- DECOMMISSIONED
- DOWNGRADIENT BOTTOM ASH POND 1/2 N/S MONITORING WELL (2018)
- DOWNGRADIENT BOTTOM ASH POND 3 N/S MONITORING WELL (2018)
- NATURE AND EXTENT/DOWNGRADIENT MONITORING WELLS
- GROUNDWATER ELEVATION CONTOUR (2' INTERVAL, DASHED WHERE INFERRED)

NOTES:

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

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

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

TITLE: GROUNDWATER CONTOUR MAP
APRIL 2022

DRAWN BY:	A. FOJTIK	PROJ. NO.:	464090.0001
CHECKED BY:	H. SCHNAIDT		
APPROVED BY:	S. HOLMSTROM		FIGURE 3
DATE:	JANUARY 2023		

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

FILE: 464090_JHC.aprx

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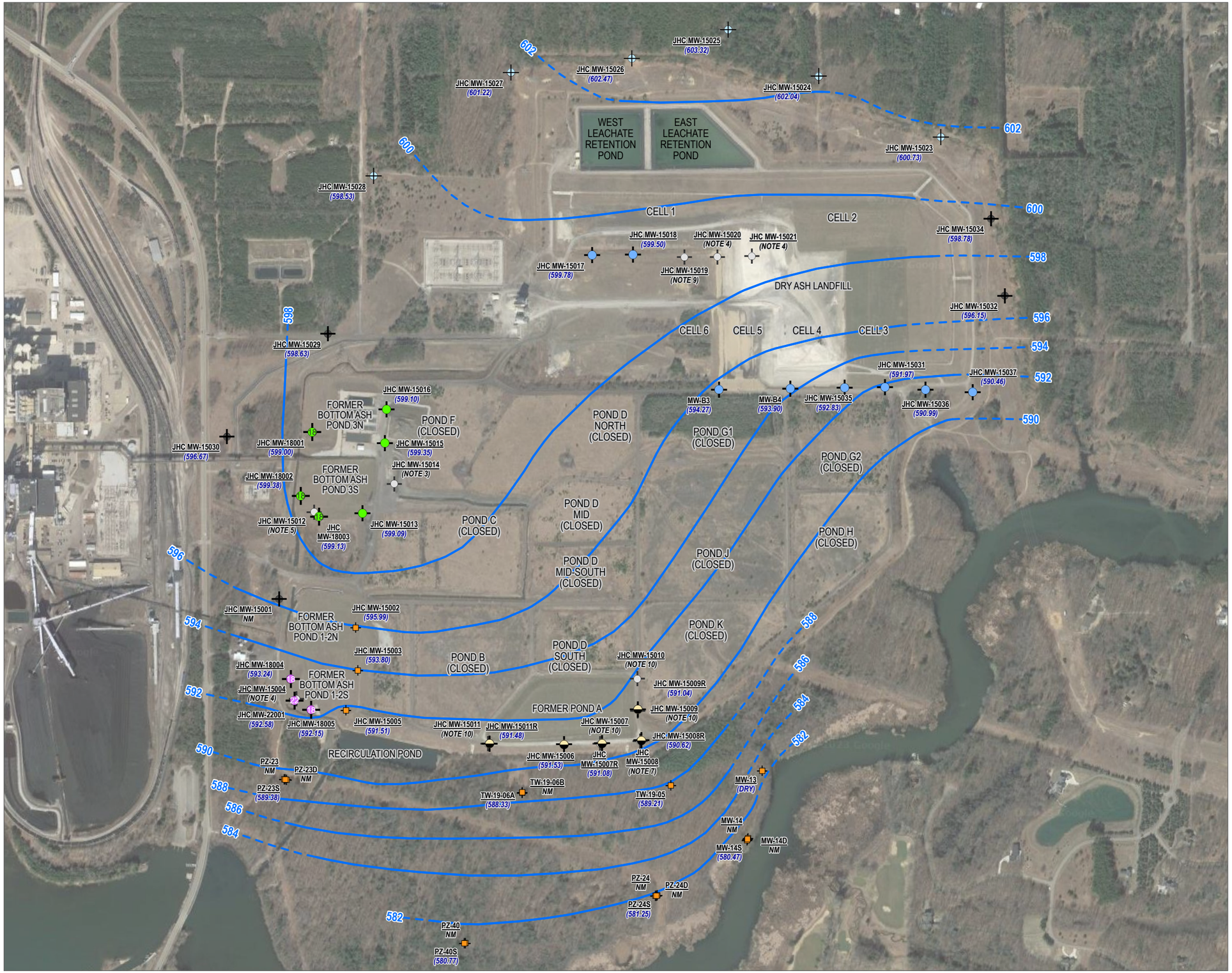

LEGEND

- BACKGROUND MONITORING WELL
- DOWNGRADIENT BOTTOM ASH POND 3 N/S MONITORING WELL
- DOWNGRADIENT LANDFILL MONITORING WELL
- DOWNGRADIENT POND A MONITORING WELL
- MONITORING WELL (STATIC WATER LEVEL ONLY)
- DECOMMISSIONED
- DOWNGRADIENT BOTTOM ASH POND 1/2 N/S MONITORING WELL (2018)
- DOWNGRADIENT BOTTOM ASH POND 1/2 N/S MONITORING WELL (2022)
- DOWNGRADIENT BOTTOM ASH POND 3 N/S MONITORING WELL (2018)
- NATURE AND EXTENT/DOWNGRADIENT MONITORING WELLS
- GROUNDWATER ELEVATION CONTOUR (2' INTERVAL, DASHED WHERE INFERRED)

NOTES:

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

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

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

TITLE: GROUNDWATER CONTOUR MAP
OCTOBER 2022

DRAWN BY:	A. FOJTIK	PROJ. NO.:	464090.0001
CHECKED BY:	H. SCHNAIDT		
APPROVED BY:	S. HOLMSTROM		FIGURE 4
DATE:	JANUARY 2023		

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

FILE: 464090_JHC.aprx

Coordinate System: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl; Map Rotation: 0
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Appendix A
Groundwater Monitoring System Certification
July 2022

Consumers Energy
Count on Us®

A CMS Energy Company

Date: July 25, 2022

To: Operating Record

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

RE: Groundwater Monitoring System Certification, §257.91(f)
JH Campbell Power Plant, Dry Ash Landfill

Introduction

According to Title 40 Code of Federal Regulations (40 CFR) Part 257, Subpart D, §257.91(f); the owner or operator of a Coal Combustion Residual (CCR) management unit must obtain a certification from a qualified professional engineer stating that the groundwater monitoring system at the CCR management unit has been designed and constructed to meet the requirements of §257.91. Additionally, §257.91(a) details a performance standard requiring the system monitor the uppermost aquifer and include a minimum of at least one upgradient and three downgradient monitoring wells, and that if the uppermost aquifer monitoring system includes the minimum number of wells, the basis supporting use of only the minimum.

Groundwater Monitoring System

A groundwater monitoring system has been established for the JH Campbell Dry Ash Landfill, which established the following locations for determining background groundwater quality and detection monitoring.

Background:

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

Downgradient Monitoring Wells:

JHC-MW-15017	JHC-MW-15018	JHC-MW-15031
JHC-MW-15035	JHC-MW-15036	JHC-MW-15037
MW-B3	MW-B4	

Static Water Level Measurement Only:

JHC-MW-15029	JHC-MW-15030	JHC MW-15032	JHC MW-15034

Provided herein, as required by §257.91(f), is certification from a qualified professional engineer that the groundwater monitoring system at Consumers Energy JH Campbell Dry Ash Landfill meets the requirements of §257.91.

CERTIFICATION

Professional Engineer Certification Statement [40 CFR 257.94(e)2]

I hereby certify that having reviewed the JH Campbell *Dry Ash Landfill Hydrogeological Monitoring Plan* (TRC, October 2020; Revised November 2021) approved by the Michigan Department of Environment, Great Lakes, and Energy (EGLE) on November 30, 2021, and being familiar with the provisions of Title 40 of the Code of Federal Regulations §257.91 (40 CFR Part 257.91), I attest that this Groundwater Monitoring System has been designed and constructed to meet the requirements of 40 CFR 257.91. The report is accurate and has been prepared in accordance with good engineering practices, including the consideration of applicable industry standards, and with the requirements of 40 CFR Part 257.91.

Harold D. Register

Signature

July 25, 2022

Date of Certification

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

Name

6201056266

Professional Engineer Certification Number

Appendix B
Data Quality Review

Laboratory Data Quality Review
Groundwater Monitoring Event April 2022
CEC JH Campbell Background Wells

Groundwater samples were collected by Consumers Energy (CE) Laboratory Services for the April 2022 sampling event. Samples were analyzed for total metals, anions, alkalinity, and total dissolved solids (TDS) by CE Laboratory Services in Jackson, Michigan. The radium analyses were subcontracted to Eurofins in St. Louis, Missouri (Eurofins - St. Louis). The laboratory analytical results were reported in laboratory sample delivery groups (SDGs) 22-0342R and 160-45244-1.

During the April 2022 sampling event, a groundwater sample was collected from each of the following wells:

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

Each sample was analyzed for the following constituents:

Analyte Group	Method
Anions (Fluoride, Chloride, Sulfate)	EPA 300.0
Total Dissolved Solids (TDS)	SM 2540C
Total Metals	SW-846 6020B/7470A
Alkalinity	SM 2320B
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, 2020) 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 for the total metals, anions, alkalinity, and TDS analyses.

This data usability report addresses the following items:

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

Review Summary

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

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

QA/QC Sample Summary

- A method blank was analyzed with each analytical batch for radium. Radium was not detected in the method blanks.
- The LCS and LCSD recoveries and relative percent differences (RPDs) for radium were within QC limits.
- One equipment blank (EB-01) and one field blank (FB-01) were collected. Target analytes were not detected in these blank samples.

- MS and MSD analyses were performed on sample JHC-MW-15025 for 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-15023 for total metals, anions, alkalinity, TDS, and radium. All criteria were met.
- Carrier recoveries, where applicable, were within 40-110%.

Laboratory Data Quality Review
Groundwater Monitoring Event April 2022
Consumers Energy JH Campbell Landfill Wells

Groundwater samples were collected by Consumers Energy (CE) Laboratory Services for the April 2022 sampling event. Samples were analyzed for total metals, anions, alkalinity, and total dissolved solids (TDS) by CE Laboratory Services in Jackson, Michigan. The radium analyses were subcontracted to Eurofins in St. Louis, Missouri (Eurofins - St. Louis). The laboratory analytical results were reported in laboratory sample delivery groups (SDGs) 22-0349R and 160-45245-1.

During the April 2022 sampling event, a groundwater sample was collected from each of the following wells:

Landfill Wells:

- JHC-MW-15017
- JHC-MW-15018
- JHC-MW-15031
- MW-B3
- MW-B4
- JHC-MW-15035
- JHC-MW-15036
- JHC-MW-15037

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

Analyte Group	Method
Anions (Fluoride, Chloride, Sulfate)	EPA 300.0
Total Dissolved Solids (TDS)	SM 2540C
Total Metals	SW-846 6020B/7470A
Alkalinity	SM 2320B
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, 2020) 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 LCS were not provided for review by CE Laboratory Services. Therefore, potential contamination arising from laboratory sample preparation and/or analytical procedures and the accuracy of the analytical method using a clean matrix could not be evaluated for the total metals, anions, alkalinity, and TDS analyses.

This data usability report addresses the following items:

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

Review Summary

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

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

QA/QC Sample Summary

- A method blank was analyzed with each analytical batch for radium. Radium was not detected in the method blanks.
- The LCS and LCSD recoveries and relative percent differences (RPDs) for radium were within QC limits.

- One equipment blank (EB-04) and one field blank (FB-04) were collected. Target analytes were not detected in these blank samples.
- MS and MSD analyses were performed on sample MW-B4 for total 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-05 and JHC-MW-15036 for total metals, anions, alkalinity, TDS, and radium.; all criteria were met.
- Carrier recoveries, where applicable, were within 40-110%.

Laboratory Data Quality Review
Groundwater Monitoring Event October 2022
CEC JH Campbell Background Wells

Groundwater samples were collected by Consumers Energy (CE) Laboratory Services for the October 2022 sampling event. Samples were analyzed for total metals, anions, alkalinity, and total dissolved solids (TDS) by CE Laboratory Services in Jackson, Michigan. The radium analyses were subcontracted to Eurofins in St. Louis, Missouri (Eurofins - St. Louis). The laboratory analytical results were reported in laboratory sample delivery groups (SDGs) 22-1096 and 160-47680-1.

During the October 2022 sampling event, a groundwater sample was collected from each of the following wells:

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

Each sample was analyzed for the following constituents:

Analyte Group	Method
Anions (Fluoride, Chloride, Sulfate)	EPA 300.0
Total Dissolved Solids (TDS)	SM 2540C
Total Metals	SW-846 6020B/7470A
Alkalinity	SM 2320B
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, 2020) and the Department of Energy Evaluation of Radiochemical Data Usability (USDOE, 1997). The following items were included in the evaluation of the data:

- Sample receipt, as noted in the cover page or case narrative;
- Technical holding times for analyses;
- Reporting limits (RLs) compared to project-required RLs;
- Data for method blanks, equipment blanks, and field blanks. Method blanks are used to assess potential contamination arising from laboratory sample preparation and/or analytical procedures. Field and equipment blanks are used to assess potential contamination arising from field procedures;

- Data for laboratory control samples (LCSs) and laboratory control sample duplicates (LCSDs), when performed. The LCSs and/or LCSDs are used to assess the accuracy of the analytical method using a clean matrix;
- Percent recoveries for matrix spike (MS) and matrix spike duplicates (MSD), when performed on project samples. Percent recoveries are calculated for each analyte spiked and used to assess bias due to sample matrix effects;
- Percent recoveries for carriers, where applicable, for radiochemistry only. Carriers are used to assess the chemical yield for the preparation and/or instrument efficiency;
- Data for laboratory duplicates, when performed on project samples. The laboratory duplicates are replicate analyses of one sample and are used to assess the precision of the analytical method;
- Data for blind field duplicates. Field duplicate samples are used to assess variability introduced by the sampling and analytical processes; and
- Overall usability of the data.

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

This data usability report addresses the following items:

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

Review Summary

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

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

QA/QC Sample Summary

- One equipment blank (EB-01) and one field blank (FB-01) were collected. Target analytes were not detected in these blank samples.
- A method blank was analyzed with each analytical batch for radium. Radium was not detected in the method blanks.
- The LCS recoveries for radium were within QC limits.
- MS and MSD analyses were performed on sample JHC-MW-15025 for total metals and anions. The recoveries were within the acceptance limits. Relative percent differences

(RPDs) were not provided by the laboratory and therefore were not evaluated; further, MS/MSD concentrations were not provided by the laboratory. However, since all recoveries were within the acceptance limits, there is no impact on data usability due to this issue.

- The field duplicate pair samples were DUP-01/JHC-MW-15023 for total metals, anions, alkalinity, TDS, and radium. All criteria were met.
- Carrier recoveries, where applicable, were within 40-110%.

Laboratory Data Quality Review
Groundwater Monitoring Event October 2022
Consumers Energy JH Campbell Landfill and Leachate Wells

Groundwater and leachate samples were collected by Consumers Energy (CE) Laboratory Services for the October 2022 sampling event. Samples were analyzed for total metals, anions, alkalinity, and total dissolved solids (TDS) by CE Laboratory Services in Jackson, Michigan. The radium analyses were subcontracted to Eurofins in St. Louis, Missouri (Eurofins - St. Louis). The laboratory analytical results were reported in laboratory sample delivery groups (SDGs) 22-1102 and 160-47678-1.

During the October 2022 sampling event, a groundwater sample was collected from each of the following wells:

Landfill Wells:

- JHC-MW-15017
- JHC-MW-15018
- JHC-MW-15031
- MW-B3
- MW-B4
- JHC-MW-15035
- JHC-MW-15036
- JHC-MW-15037

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

Analyte Group	Method
Anions (Fluoride, Chloride, Sulfate)	EPA 300.0
Total Dissolved Solids (TDS)	SM 2540C
Total Metals	SW-846 6020B/7470A
Alkalinity	SM 2320B
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, 2020) 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 LCS were not provided for review by CE Laboratory Services. Therefore, potential contamination arising from laboratory sample preparation and/or analytical procedures and the accuracy of the analytical method using a clean matrix could not be evaluated for the total metals, anions, alkalinity, and TDS analyses.

This data usability report addresses the following items:

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

Review Summary

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

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

QA/QC Sample Summary

- One equipment blank (EB-05) and one field blank (FB-05) were collected. Target analytes were not detected in these blank samples.
- A method blank was analyzed with each analytical batch for radium. Radium was not detected in the method blanks with following exception. Radium 228 was detected in MB

160-5888355/1-A at 0.7325 +/- 0.375 pCi/L. Associated samples JHC-MW-15037 and DUP-05 had detections of radium 228 and the normalized absolute differences were < 1.96 indicating potential false positive results. However, these sample results were also associated with a high recovery for radium 228 in the associated LCS as stated below. Thus, the detections of radium 228 in samples JHC-MW-15037 and DUP-05 should be considered estimated, as summarized the Attachment A.

- The LCS percent recoveries (%Rs) for radium were within QC limits with the following exceptions
  - The %R for radium 228 in LCS 160-588355/2-A was 158%. Associated samples JHC-MW-15037 and DUP-05 had detections of radium 228 and were also associated with a method blank that had a radium 228 detection as stated above. The detections of radium 228 in samples JHC-MW-15037 and DUP-05 should be considered estimated, as summarized in Attachment A.
- MS and MSD analyses were performed on sample MW-B4 for total metals and anions. The recoveries were within the acceptance limits. Relative percent differences (RPDs) were not provided by the laboratory and therefore were not evaluated; further, MS/MSD concentrations were not provided by the laboratory. However, since all recoveries were within the acceptance limits, there is no impact on data usability due to this issue.
- The field duplicate pair samples were DUP-05 and JHC-MW-15036 for total metals, anions, alkalinity, TDS, and radium. All criteria were met.
- Carrier recoveries, where applicable, were within 40-110%.

Attachment A

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

Samples	Collection Date	Analyte	Non-Conformance/Issue
JHC-MW-15037	10/20/2022	Radium 228	Detected result is estimated due to method blank contamination and high LCS recovery.
DUP-05	10/20/2022		

Appendix C
April 2022 Assessment Monitoring Statistical Evaluation

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Technical Memorandum

Date:	July 29, 2022
To:	Bethany Swanberg, Consumers Energy
From:	Sarah Holmstrom, TRC Kristin Lowery, TRC
Project No.:	464090.0000.0000 Phase 1 Task 2
Subject:	Statistical Evaluation of April 2022 Assessment Monitoring Sampling Event JH Campbell Dry Ash Landfill, 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 Protection 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) Dry Ash Landfill. The first semiannual assessment monitoring event for 2022 was conducted on April 11 through 14, 2022. 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 (TRC, January 2019). The following narrative describes the methods employed and the results obtained.

The statistical evaluation of the first semiannual assessment monitoring event of 2022 data indicates no constituents are present at statistically significant levels that exceed the GWPSs at the Dry Ash Landfill monitoring wells.

Constituent	GWPS	# Downgradient Wells Observed

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

These results are consistent with the results of the previous assessment monitoring data statistical 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 Dry Ash Landfill CCR Unit previously consisted of eleven monitoring wells (JHC-MW-15017 through JHC-MW-15019, JHC-MW-15022, and JHC-MW-15031 through JHC-MW-15037) located on the south and east perimeters of the landfill Cells 1 through 4. In 2021, the Dry Ash Landfill Hydrogeological Monitoring Plan (HMP) (TRC, October 2020, Revised November 2021) was prepared under the Michigan Part 115 Solid Waste Management Rules, as amended, and approved by EGLE on November 30, 2021. The HMP established an updated compliance monitoring network at the Dry Ash Landfill consisting of eight monitoring wells (JHC-MW-15017, JHC-MW-15018, JHC-MW-15031, JHC-MW-15035 through JHC-MW-15037, MW-B3, and MW-B4) located on the south perimeter of the landfill Cells 1 through 6 and removing several side gradient wells along the east perimeter. The compliance well network for the Dry Ash Landfill CCR monitoring program was recertified on July 25, 2022 to align with the HMP.

Following the semiannual assessment monitoring sampling event, compliance well data for the JHC Dry Ash Landfill 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 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).

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

For each detected Appendix IV constituent, the concentrations from each well were first compared directly to the GWPS, as shown on Table 1. No parameter-well combinations included a direct exceedance of the GWPS within the past 8 events (November 2018 through April 2022) for data that met project data quality objectives[3]. Therefore, no confidence limits were calculated for the Dry Ash Landfill.

The direct comparison of the Appendix IV constituents shows no potential GWPS exceedances. These results are consistent with the results of the initial assessment monitoring data statistical evaluation and Consumers Energy will continue executing the self-implementing groundwater compliance schedule in conformance with §257.90 - §257.98.

Attachments

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

[3] An anomalously high chromium result was reported for JHC-MW-15035 in April 2019. Reanalysis was conducted with similar results, but the relative percent difference (RPD) was above the acceptance criteria. The well was resampled in June 2019 with results consistent with earlier sampling events. The June 2019 chromium concentration is used for statistical analysis in lieu of the April 2019 results.

Table 1

Table 1
Comparison of Groundwater Sampling Results to Groundwater Protection Standards for Statistical Evaluation
JH Campbell Landfill – RCRA CCR Monitoring Program
West Olive, Michigan

						Sample Location:	JHC-MW-15017							
						Sample Date:	11/13/2018	4/23/2019	10/8/2019	4/14/2020	10/21/2020	4/13/2021	4/13/2021	10/21/2021	4/12/2022
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS								Field Dup		
Appendix III															
Boron	ug/L	NC	NA	51	NA		274	340	350	243	210	148	151	167	161
Calcium	mg/L	NC	NA	46	NA		60.9	81	77	64.4	54.9	61.1	60.4	58.5	60.6
Chloride	mg/L	250*	NA	43	NA		170	120	60	36.0	37.4	31.0	30.8	29.9	25.4
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		72.0	100	92	69.0	62.9	43.6	43.4	46.4	39.2
Total Dissolved Solids	mg/L	500*	NA	258	NA		474	520	280	339	NA(3)	296	303	292	276
pH, Field	SU	6.5 - 8.5*	NA	4.8 - 9.2	NA		6.1	6.1	6.3	5.6	5.9	6.1	--	6.5	6.8
Appendix IV															
Antimony	ug/L	6	NA	2	6		< 1.0	< 1.0	< 1.0	< 1	< 1	< 1	< 1	< 1	< 1
Arsenic	ug/L	10	NA	1	10		< 1.0	< 1.0	< 1.0	< 1	< 1	< 1	< 1	< 1	< 1
Barium	ug/L	2,000	NA	35	2,000		85.5	70	47	34	22	25	25	28	24
Beryllium	ug/L	4	NA	1	4		< 1.0	< 1.0	< 1.0	< 1	< 1	< 1	< 1	< 1	< 1
Cadmium	ug/L	5	NA	0.2	5		0.60	0.57	0.24	0.4	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium	ug/L	100	NA	2	100		< 1.0	12	< 1.0	< 1	1	< 1	< 1	< 1	2
Cobalt	ug/L	NC	6	15	15		< 6.0	< 6.0	< 6.0	< 15	< 15	< 6	< 6	< 6	< 6
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	< 1	< 1	< 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	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Molybdenum	ug/L	NC	100	5	100		28.5	11	10	16	21	5	5	< 5	< 5
Radium-226/228	pCi/L	5	NA	1.93	5		< 1.96	1.00	0.643	0.618	0.574	< 0.354	< 0.497	0.660	< 0.376
Selenium	ug/L	50	NA	5	50		18.8	16	14	16	15	14	13	20	18
Thallium	ug/L	2	NA	2	2		< 2.0	< 2.0	< 2.0	< 2	< 2	< 2	< 2	< 2	< 2

Notes:

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

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

NA - not applicable.

-- - 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 HMP.

All metals were analyzed as total unless otherwise specified.

(1) April 2019 result not used for assessment monitoring.

(2) Due to anomalous chromium result and uncertainty that associated data quality objectives were met for the April 2019 analysis, a resample was collected June 21, 2019. The June 2019 result met data quality objectives and did not confirm the April 2019 result; therefore the June 2019 result is used for assessment monitoring in place of the April 2019 data.

(3) Total dissolved solids data for the October 2020 event contained errors introduced by the laboratory materials manufacturer and were determined to be unusable.

Table 1
Comparison of Groundwater Sampling Results to Groundwater Protection Standards for Statistical Evaluation
JH Campbell Landfill – RCRA CCR Monitoring Program
West Olive, Michigan

						Sample Location:	JHC-MW-15018									
						Sample Date:	11/13/2018	4/23/2019	10/8/2019	4/14/2020	4/14/2020	10/21/2020	10/21/2020	4/13/2021	10/21/2021	4/13/2022
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS						Field Dup		Field Dup			
Appendix III																
Boron	ug/L	NC	NA	51	NA		115	130	170	142	148	167	165	258	327	287
Calcium	mg/L	NC	NA	46	NA		37.6	58	48	50.6	50.7	65.0	68.1	85.2	62.7	65.9
Chloride	mg/L	250*	NA	43	NA		33.2	43	44	28.5	28.3	35.9	34.5	34.2	25.9	28.8
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		51.1	61	84	52.8	52.9	59.0	55.7	56.7	73.2	58.7
Total Dissolved Solids	mg/L	500*	NA	258	NA		276	320	370	405	287	NA(3)	NA(3)	375	329	300
pH, Field	SU	6.5 - 8.5*	NA	4.8 - 9.2	NA		6.3	6.4	6.0	6.2	--	6.0	--	5.9	6.0	5.9
Appendix IV																
Antimony	ug/L	6	NA	2	6		< 1.0	< 1.0	< 1.0	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Arsenic	ug/L	10	NA	1	10		< 1.0	< 1.0	< 1.0	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Barium	ug/L	2,000	NA	35	2,000		79.6	80	130	96	95	77	78	57	61	45
Beryllium	ug/L	4	NA	1	4		< 1.0	< 1.0	< 1.0	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Cadmium	ug/L	5	NA	0.2	5		< 0.20	< 0.20	0.29	0.2	0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium	ug/L	100	NA	2	100		< 1.0	< 1.0	< 1.0	< 1	3	< 1	< 1	< 1	< 1	< 1
Cobalt	ug/L	NC	6	15	15		< 6.0	< 6.0	< 6.0	< 15	< 15	< 15	< 15	< 6	< 6	< 6
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	< 1	< 1	< 1	< 1	< 1	< 1
Lithium	ug/L	NC	40	10	40		< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Mercury	ug/L	2	NA	0.2	2		< 0.20	< 0.20	< 0.20	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Molybdenum	ug/L	NC	100	5	100		6.7	< 5.0	< 5.0	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Radium-226/228	pCi/L	5	NA	1.93	5		< 1.68	< 0.476	0.739	< 0.575	< 0.561	0.747	0.926	< 0.439	0.616	0.343
Selenium	ug/L	50	NA	5	50		8.2	12	15	12	13	14	13	21	20	18
Thallium	ug/L	2	NA	2	2		< 2.0	< 2.0	< 2.0	< 2	< 2	< 2	< 2	< 2	< 2	< 2

Notes:

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

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

NA - not applicable.

-- - 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.

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(3) Total dissolved solids data for the October 2020 event contained errors introduced by the laboratory materials manufacturer and were determined to be unusable.

Table 1
Comparison of Groundwater Sampling Results to Groundwater Protection Standards for Statistical Evaluation
JH Campbell Landfill – RCRA CCR Monitoring Program
West Olive, Michigan

						Sample Location:	JHC-MW-15031						
						Sample Date:	11/14/2018	4/24/2019	10/9/2019	4/14/2020	10/21/2020	4/13/2021	10/22/2021	4/12/2022
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS									
Appendix III														
Boron	ug/L	NC	NA	51	NA		104	79	85	75	114	51	64	58
Calcium	mg/L	NC	NA	46	NA		63.3	59	57	49.8	56.1	49.7	54.2	59.8
Chloride	mg/L	250*	NA	43	NA		33.4	24	28	20.1	25.0	9.49	7.56	10.4
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
Sulfate	mg/L	250*	NA	14	NA		34.7	25	26	23.5	35.1	27.7	21.3	27.5
Total Dissolved Solids	mg/L	500*	NA	258	NA		268	280	220	266	NA(3)	180	< 10	220
pH, Field	SU	6.5 - 8.5*	NA	4.8 - 9.2	NA		6.7	6.9	6.9	6.7	6.4	7.1	7.3	7.1
Appendix IV														
Antimony	ug/L	6	NA	2	6		< 1.0	< 1.0	< 1.0	< 1	< 1	< 1	< 1	< 1
Arsenic	ug/L	10	NA	1	10		< 1.0	< 1.0	< 1.0	< 1	< 1	< 1	< 1	< 1
Barium	ug/L	2,000	NA	35	2,000		21.4	14	17	17	20	15	15	14
Beryllium	ug/L	4	NA	1	4		< 1.0	< 1.0	< 1.0	< 1	< 1	< 1	< 1	< 1
Cadmium	ug/L	5	NA	0.2	5		< 0.20	< 0.20	< 0.20	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium	ug/L	100	NA	2	100		24.6	5.4	1.9	< 1	3	< 1	< 1	1
Cobalt	ug/L	NC	6	15	15		< 6.0	< 6.0	< 6.0	< 15	< 15	< 6	< 6	< 6
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
Lead	ug/L	NC	15	1	15		1.3	< 1.0	< 1.0	< 1	< 1	< 1	< 1	< 1
Lithium	ug/L	NC	40	10	40		< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Mercury	ug/L	2	NA	0.2	2		< 0.20	< 0.20	< 0.20	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Molybdenum	ug/L	NC	100	5	100		< 5.0	< 5.0	< 5.0	< 5	< 5	< 5	< 5	< 5
Radium-226/228	pCi/L	5	NA	1.93	5		< 1.50	0.466	0.798	< 0.412	< 0.412	< 0.502	< 0.435	< 0.456
Selenium	ug/L	50	NA	5	50		2.4	< 1.0	< 1.0	2	3	3	3	3
Thallium	ug/L	2	NA	2	2		< 2.0	< 2.0	< 2.0	< 2	< 2	< 2	< 2	< 2

Notes:

ug/L - micrograms per liter; mg/L - milligrams per liter.
pCi/L - picocuries per liter; SU - standard units; pH is a field parameter.
NA - not applicable.
-- - 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 HMP.
All metals were analyzed as total unless otherwise specified.
(1) April 2019 result not used for assessment monitoring.
(2) Due to anomalous chromium result and uncertainty that associated data quality objectives were met for the April 2019 analysis, a resample was collected June 21, 2019. The June 2019 result met data quality objectives and did not confirm the April 2019 result; therefore the June 2019 result is used for assessment monitoring in place of the April 2019 data.
(3) Total dissolved solids data for the October 2020 event contained errors introduced by the laboratory materials manufacturer and were determined to be unusable.

Table 1
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JH Campbell Landfill – RCRA CCR Monitoring Program
West Olive, Michigan

						Sample Location:	JHC-MW-15035								
						Sample Date:	11/14/2018	4/24/2019	6/21/2019	6/21/2019	10/9/2019	4/14/2020	10/22/2020	4/14/2021	10/22/2021	4/12/2022
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS											
Appendix III										Field Dup						
Boron	ug/L	NC	NA	51	NA		78.2	91	--	--	78	64	60	52	73	81
Calcium	mg/L	NC	NA	46	NA		66.6	98	--	--	84	70.4	65.7	56.8	82.0	79.2
Chloride	mg/L	250*	NA	43	NA		20	23	--	--	24	15.0	10.9	9.07	14.0	9.35
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
Sulfate	mg/L	250*	NA	14	NA		18.8	24	--	--	25	21.1	19.6	17.5	26.2	25.7
Total Dissolved Solids	mg/L	500*	NA	258	NA		274	360	--	--	370	300	NA(3)	240	365	320
pH, Field	SU	6.5 - 8.5*	NA	4.8 - 9.2	NA		7.3	7.2	7.1	--	7.2	7.2	7.2	7.3	7.2	7.2
Appendix IV																
Antimony	ug/L	6	NA	2	6		< 1.0	< 1.0	--	--	< 1.0	< 1	< 1	< 1	< 1	< 1
Arsenic	ug/L	10	NA	1	10		< 1.0	< 1.0	--	--	< 1.0	< 1	< 1	< 1	< 1	< 1
Barium	ug/L	2,000	NA	35	2,000		12.3	17	--	--	16	17	13	12	19	17
Beryllium	ug/L	4	NA	1	4		< 1.0	< 1.0	--	--	< 1.0	< 1	< 1	< 1	< 1	< 1
Cadmium	ug/L	5	NA	0.2	5		< 0.20	< 0.20	--	--	< 0.20	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium	ug/L	100	NA	2	100		< 1.0	290(1)(2)	1.8(2)	2.5(2)	4.4	< 1	< 1	< 1	< 1	< 1
Cobalt	ug/L	NC	6	15	15		< 6.0	< 6.0	--	--	< 6.0	< 15	< 15	< 6	< 6	< 6
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
Lead	ug/L	NC	15	1	15		< 1.0	< 1.0	--	--	< 1.0	< 1	< 1	< 1	< 1	< 1
Lithium	ug/L	NC	40	10	40		< 10	< 10	--	--	< 10	< 10	< 10	< 10	< 10	< 10
Mercury	ug/L	2	NA	0.2	2		< 0.20	< 0.20	--	--	< 0.20	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Molybdenum	ug/L	NC	100	5	100		< 5.0	11	--	--	< 5.0	< 5	< 5	< 5	< 5	< 5
Radium-226/228	pCi/L	5	NA	1.93	5		< 1.76	< 0.357	--	--	< 0.567	0.687	< 0.647	< 0.425	0.728	< 0.378
Selenium	ug/L	50	NA	5	50		< 1.0	< 1.0	--	--	< 1.0	1	2	2	2	3
Thallium	ug/L	2	NA	2	2		< 2.0	< 2.0	--	--	< 2.0	< 2	< 2	< 2	< 2	< 2

Notes:

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

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

NA - not applicable.

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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 HMP.

All metals were analyzed as total unless otherwise specified.

(1) April 2019 result not used for assessment monitoring.

(2) Due to anomalous chromium result and uncertainty that associated data quality objectives were met for the April 2019 analysis, a resample was collected June 21, 2019. The June 2019 result met data quality objectives and did not confirm the April 2019 result; therefore the June 2019 result is used for assessment monitoring in place of the April 2019 data.

(3) Total dissolved solids data for the October 2020 event contained errors introduced by the laboratory materials manufacturer and were determined to be unusable.

Table 1
Comparison of Groundwater Sampling Results to Groundwater Protection Standards for Statistical Evaluation
JH Campbell Landfill – RCRA CCR Monitoring Program
West Olive, Michigan

						Sample Location:	JHC-MW-15036							
						Sample Date:	11/14/2018	4/24/2019	10/8/2019	4/14/2020	10/22/2020	4/14/2021	10/22/2021	4/12/2022	4/12/2022
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS										
Appendix III															Field Dup
Boron	ug/L	NC	NA	51	NA		79.2	80	71	77	81	80	76	94	94
Calcium	mg/L	NC	NA	46	NA		51.6	50	55	51.1	59.3	52.1	39.5	57.6	57.0
Chloride	mg/L	250*	NA	43	NA		14.7	14	13	8.51	10.4	9.50	5.71	9.20	9.13
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		20.0	19	24	17.4	21.9	21.0	14.5	19.2	19.1
Total Dissolved Solids	mg/L	500*	NA	258	NA		216	220	320	221	NA(3)	229	169	238	246
pH, Field	SU	6.5 - 8.5*	NA	4.8 - 9.2	NA		7.4	7.4	7.5	7.3	7.3	7.1	7.6	7.4	--
Appendix IV															
Antimony	ug/L	6	NA	2	6		< 1.0	< 1.0	< 1.0	< 1	< 1	< 1	< 1	< 1	< 1
Arsenic	ug/L	10	NA	1	10		< 1.0	< 1.0	< 1.0	< 1	< 1	< 1	< 1	< 1	< 1
Barium	ug/L	2,000	NA	35	2,000		8.2	8.4	9.4	9	9	8	7	9	10
Beryllium	ug/L	4	NA	1	4		< 1.0	< 1.0	< 1.0	< 1	< 1	< 1	< 1	< 1	< 1
Cadmium	ug/L	5	NA	0.2	5		< 0.20	< 0.20	< 0.20	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium	ug/L	100	NA	2	100		< 1.0	< 1.0	< 1.0	< 1	< 1	< 1	< 1	< 1	< 1
Cobalt	ug/L	NC	6	15	15		< 6.0	< 6.0	< 6.0	< 15	< 15	< 6	< 6	< 6	< 6
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	< 1	< 1	< 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	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Molybdenum	ug/L	NC	100	5	100		< 5.0	< 5.0	< 5.0	< 5	< 5	< 5	< 5	< 5	< 5
Radium-226/228	pCi/L	5	NA	1.93	5		0.874	< 0.384	0.442	0.659	< 0.554	< 0.486	< 0.386	< 0.395	< 0.398
Selenium	ug/L	50	NA	5	50		< 1.0	< 1.0	1.9	< 1	< 1	< 1	1	2	2
Thallium	ug/L	2	NA	2	2		< 2.0	< 2.0	< 2.0	< 2	< 2	< 2	< 2	< 2	< 2

Notes:

ug/L - micrograms per liter; mg/L - milligrams per liter.
pCi/L - picocuries per liter; SU - standard units; pH is a field parameter.
NA - not applicable.
-- - 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 HMP.
All metals were analyzed as total unless otherwise specified.
(1) April 2019 result not used for assessment monitoring.
(2) Due to anomalous chromium result and uncertainty that associated data quality objectives were met for the April 2019 analysis, a resample was collected June 21, 2019. The June 2019 result met data quality objectives and did not confirm the April 2019 result; therefore the June 2019 result is used for assessment monitoring in place of the April 2019 data.
(3) Total dissolved solids data for the October 2020 event contained errors introduced by the laboratory materials manufacturer and were determined to be unusable.

Table 1
Comparison of Groundwater Sampling Results to Groundwater Protection Standards for Statistical Evaluation
JH Campbell Landfill – RCRA CCR Monitoring Program
West Olive, Michigan

						Sample Location:	JHC-MW-15037								MW-B3	MW-B4
						Sample Date:	11/14/2018	4/24/2019	10/8/2019	4/14/2020	10/22/2020	4/14/2021	10/22/2021	4/12/2022	4/12/2022	4/12/2022
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS											
Appendix III																
Boron	ug/L	NC	NA	51	NA		221	150	280	266	185	112	118	170	92	178
Calcium	mg/L	NC	NA	46	NA		103	73	110	100	93.4	59.0	61.7	85.1	95.8	52.5
Chloride	mg/L	250*	NA	43	NA		8.2	6.3	4.4	2.65	7.52	21.3	7.05	6.92	6.65	19.6
Fluoride	ug/L	4,000	NA	1,000	NA		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	1,490	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	250*	NA	14	NA		50.1	22	46	25.9	53.5	17.2	17.7	42.8	24.1	18.5
Total Dissolved Solids	mg/L	500*	NA	258	NA		406	270	400	385	NA(3)	254	249	359	348	245
pH, Field	SU	6.5 - 8.5*	NA	4.8 - 9.2	NA		7.3	7.3	7.3	7.1	7.0	6.7	7.2	7.2	6.5	7.2
Appendix IV																
Antimony	ug/L	6	NA	2	6		< 1.0	< 1.0	< 1.0	< 1	< 1	< 1	< 1	< 1	1	< 1
Arsenic	ug/L	10	NA	1	10		< 1.0	< 1.0	< 1.0	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Barium	ug/L	2,000	NA	35	2,000		14.3	9.7	14	15	14	10	11	18	70	29
Beryllium	ug/L	4	NA	1	4		< 1.0	< 1.0	< 1.0	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Cadmium	ug/L	5	NA	0.2	5		< 0.20	< 0.20	< 0.20	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium	ug/L	100	NA	2	100		1.6	1.7	1.2	< 1	< 1	< 1	< 1	1	1	2
Cobalt	ug/L	NC	6	15	15		< 6.0	< 6.0	< 6.0	< 15	< 15	< 6	< 6	< 6	< 6	< 6
Fluoride	ug/L	4,000	NA	1,000	4,000		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	1,490	< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	15	1	15		< 1.0	< 1.0	< 1.0	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Lithium	ug/L	NC	40	10	40		< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	12	< 10
Mercury	ug/L	2	NA	0.2	2		< 0.20	< 0.20	< 0.20	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Molybdenum	ug/L	NC	100	5	100		< 5.0	< 5.0	< 5.0	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Radium-226/228	pCi/L	5	NA	1.93	5		< 1.31	0.403	< 0.518	< 0.449	< 0.535	< 0.465	< 0.397	< 0.312	0.558	< 0.410
Selenium	ug/L	50	NA	5	50		21.1	3.8	16	10	12	4	5	19	29	4
Thallium	ug/L	2	NA	2	2		< 2.0	< 2.0	< 2.0	< 2	< 2	< 2	< 2	< 2	< 2	< 2

Notes:

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

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

NA - not applicable.

-- - 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 HMP.

All metals were analyzed as total unless otherwise specified.

(1) April 2019 result not used for assessment monitoring.

(2) Due to anomalous chromium result and uncertainty that associated data quality objectives were met for the April 2019 analysis, a resample was collected June 21, 2019. The June 2019 result met data quality objectives and did not confirm the April 2019 result; therefore the June 2019 result is used for assessment monitoring in place of the April 2019 data.

(3) Total dissolved solids data for the October 2020 event contained errors introduced by the laboratory materials manufacturer and were determined to be unusable.

Appendix D
October 2022 Assessment Monitoring Statistical Evaluation

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Technical Memorandum

Date:	January 16, 2023
To:	Bethany Swanberg, Consumers Energy
From:	Sarah Holmstrom, TRC Kristin Lowery, TRC Henry Schnaidt, TRC
Project No.:	464090.0000.0000 Phase 1 Task 2
Subject:	Statistical Evaluation of October 2022 Assessment Monitoring Sampling Event JH Campbell Dry Ash Landfill, Consumers Energy Company, West Olive, Michigan

During the statistical evaluation of the initial assessment monitoring event (June 2018), no Appendix IV constituents were present at statistically significant levels exceeding the Groundwater Protection 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 Dry Ash Landfill. The second semiannual assessment monitoring event for 2022 was conducted on October 17 through October 20, 2022. 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 (TRC, January 2019). The following narrative describes the methods employed and the results obtained.

The statistical evaluation of the second semiannual assessment monitoring event of 2022 data indicates no constituents are present at statistically significant levels that exceed the GWPSs at the Dry Ash Landfill monitoring wells.

Constituent	GWPS	# Downgradient Wells Observed

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

[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.

These results are consistent with the results of the previous assessment monitoring data statistical evaluations and concentrations remain above background levels. Consumers Energy will continue semiannual assessment monitoring per §257.95 and continue to execute the self-implementing groundwater compliance schedule in conformance with §257.90 - §257.98.

Assessment Monitoring Statistical Evaluation

The compliance well network at the JHC Dry Ash Landfill CCR Unit previously consisted of eleven monitoring wells (JHC-MW-15017 through JHC-MW-15019, JHC-MW-15022, and JHC-MW-15031 through JHC-MW-15037) located on the south and east perimeters of the landfill Cells 1 through 4. In 2021, the Dry Ash Landfill Hydrogeological Monitoring Plan (HMP) (TRC, October 2020, Revised November 2021) was prepared under the Michigan Part 115 Solid Waste Management Rules, as amended, and approved by EGLE on November 30, 2021. The HMP established an updated compliance monitoring network at the Dry Ash Landfill consisting of eight monitoring wells (JHC-MW-15017, JHC-MW-15018, JHC-MW-15031, JHC-MW-15035 through JHC-MW-15037, MW-B3, and MW-B4) located on the south perimeter of the landfill Cells 1 through 6 and removing several side gradient wells along the east perimeter. The compliance well network for the Dry Ash Landfill CCR monitoring program was recertified on July 25, 2022 to align with the HMP.

Following the semiannual assessment monitoring sampling event, compliance well data for the Dry Ash Landfill 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 constituent, the concentrations from each well were first compared directly to the GWPS, as shown on Table 1. Monitoring wells MW-B3 and MW-B4 were not part of the CCR monitoring program prior to 2022; they were previously monitored under the old HMP which deviates from the sampling and analysis procedures included in the November 2021 sample and analysis plan (SAP) i that is used for the semiannual assessment monitoring program. Constituent-well combinations that included a direct exceedance of the GWPS within the past eight monitoring events (April 2029 through October 2022) were retained for further analysis (Attachment 1). Direct comparison GWPS exceedances include the following constituent well combinations:

- Antimony in JHC-MW-15035.

Groundwater data were then evaluated utilizing Sanitas™ statistical software. Sanitas™ is a software tool that is commercially available for performing statistical evaluations consistent with procedures outlined in the Unified Guidance. Within the Sanitas™ statistical program, confidence limits were selected to perform the statistical comparison of compliance data to a fixed standard. Parametric or non-parametric confidence intervals were calculated, as appropriate, for each of the constituents using a 99 percent confidence level for each individual statistical test, i.e., a significance level (α) of 0.01. The following narrative describes the methods employed, the results obtained and the Sanitas™ output files are included as an attachment.

The statistical data evaluation included the following steps:

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

The results of these evaluations are presented and discussed below.

Initially, results for the past eight events were observed visually for potential trends and outliers (time-series plots in Attachment 1). No outliers or significant trends were noted.

Data from each round were evaluated for completeness, overall quality, and usability and were deemed appropriate for the purposes of the groundwater monitoring program, except as noted in Table 1. The Sanitas™ software was then used to test compliance at the downgradient monitoring wells using the confidence interval method for the most recent eight sampling events. Eight independent sampling events provide an appropriate density of data as recommended per the Unified Guidance yet are collected recently enough to provide an indication of current conditions. The tests were run with a per-well significance of $\alpha = 0.01$. The software outputs are included in Attachment 1 along with data reports showing the values used for the evaluation. The percentage of non-detect observations are also included in Attachment 1. Non-detect data were handled in accordance with the HMP for the purposes of calculating the confidence intervals.

The Sanitas™ software generates an output that includes graphs of the parametric or non-parametric confidence intervals for each well along with notes on data transformations, as appropriate. The data distributions are as follows:

Distribution	Constituent-Well Combinations
Non-Parametric (non-detects)	Antimony at JHC-MW-15035

The confidence interval test compares the lower confidence limit to the GWPS. The results of the assessment monitoring statistical evaluation for the downgradient wells indicate that no constituents are present at statistically significant concentrations above the GWPS. Consumers Energy will continue executing the self-implementing groundwater compliance schedule in conformance with §257.90 - §257.98.

Attachments

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

Attachment 1 Sanitas™ Output

Table 1

Table 1

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

JH Campbell Landfill – RCRA CCR Monitoring Program

West Olive, Michigan

		Sample Location:	JHC-MW-15017								
		Sample Date:	4/23/2019	10/8/2019	4/14/2020	10/21/2020	4/13/2021	4/13/2021	10/21/2021	4/12/2022	10/20/2022
Constituent	Unit	GWPS									
Appendix III								Field Dup			
Boron	ug/L	NA	340	350	243	210	148	151	167	161	163
Calcium	mg/L	NA	81	77	64.4	54.9	61.1	60.4	58.5	60.6	61.6
Chloride	mg/L	NA	120	60	36.0	37.4	31.0	30.8	29.9	25.4	24.1
Fluoride	ug/L	NA	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	NA	100	92	69.0	62.9	43.6	43.4	46.4	39.2	43.2
Total Dissolved Solids	mg/L	NA	520	280	339	NU(3)	296	303	292	276	313
pH, Field	SU	NA	6.1	6.3	5.6	5.9	6.1	--	6.5	6.8	6.4
Appendix IV											
Antimony	ug/L	**6**	< 1.0	< 1.0	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Arsenic	ug/L	10	< 1.0	< 1.0	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Barium	ug/L	2,000	70	47	34	22	25	25	28	24	28
Beryllium	ug/L	4	< 1.0	< 1.0	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Cadmium	ug/L	5	0.57	0.24	0.4	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium	ug/L	100	12	< 1.0	< 1	1	< 1	< 1	< 1	2	< 1
Cobalt	ug/L	15	< 6.0	< 6.0	< 15	< 15	< 6	< 6	< 6	< 6	< 6
Fluoride	ug/L	4,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	15	< 1.0	< 1.0	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Lithium	ug/L	40	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Mercury	ug/L	2	< 0.20	< 0.20	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Molybdenum	ug/L	100	11	10	16	21	5	5	< 5	< 5	< 5
Radium-226/228	pCi/L	5	1.00	0.643	0.618	0.574	< 0.354	< 0.497	0.660	< 0.376	< 0.627
Selenium	ug/L	50	16	14	16	15	14	13	20	18	19
Thallium	ug/L	2	< 2.0	< 2.0	< 2	< 2	< 2	< 2	< 2	< 2	< 2

Notes:

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

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

NA - not applicable.

NU - sample results are unusable.

-- - not analyzed.

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

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

All metals were analyzed as total unless otherwise specified.

(1) April 2019 result not used for assessment monitoring.

(2) Due to anomalous chromium result and uncertainty that associated data quality objectives were met for the April 2019 analysis, a resample was collected June 21, 2019. The June 2019 result met data quality objectives and did not confirm the April 2019 result; therefore the June 2019 result is used for assessment monitoring in place of the April 2019 data.

(3) Total dissolved solids data for the October 2020 event contained errors introduced by the laboratory materials manufacturer and were determined to be unusable.

Table 1

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

JH Campbell Landfill – RCRA CCR Monitoring Program

West Olive, Michigan

	Sample Location:		JHC-MW-15018									
		Sample Date:	4/23/2019	10/8/2019	4/14/2020	4/14/2020	10/21/2020	10/21/2020	4/13/2021	10/21/2021	4/13/2022	10/20/2022
Constituent	Unit	GWPS										
Appendix III						Field Dup		Field Dup				
Boron	ug/L	NA	130	170	142	148	167	165	258	327	287	269
Calcium	mg/L	NA	58	48	50.6	50.7	65.0	68.1	85.2	62.7	65.9	59.6
Chloride	mg/L	NA	43	44	28.5	28.3	35.9	34.5	34.2	25.9	28.8	25.5
Fluoride	ug/L	NA	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	NA	61	84	52.8	52.9	59.0	55.7	56.7	73.2	58.7	53.6
Total Dissolved Solids	mg/L	NA	320	370	405	287	NU(3)	NU(3)	375	329	300	316
pH, Field	SU	NA	6.4	6.0	6.2	--	6.0	--	5.9	6.0	5.9	5.9
Appendix IV												
Antimony	ug/L	**6**	< 1.0	< 1.0	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Arsenic	ug/L	10	< 1.0	< 1.0	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Barium	ug/L	2,000	80	130	96	95	77	78	57	61	45	31
Beryllium	ug/L	4	< 1.0	< 1.0	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Cadmium	ug/L	5	< 0.20	0.29	0.2	0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium	ug/L	100	< 1.0	< 1.0	< 1	3	< 1	< 1	< 1	< 1	< 1	< 1
Cobalt	ug/L	15	< 6.0	< 6.0	< 15	< 15	< 15	< 15	< 6	< 6	< 6	< 6
Fluoride	ug/L	4,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	15	< 1.0	< 1.0	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Lithium	ug/L	40	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Mercury	ug/L	2	< 0.20	< 0.20	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Molybdenum	ug/L	100	< 5.0	< 5.0	< 5	< 5	< 5	< 5	< 5	< 5	< 5	6
Radium-226/228	pCi/L	5	< 0.476	0.739	< 0.575	< 0.561	0.747	0.926	< 0.439	0.616	0.343	0.682
Selenium	ug/L	50	12	15	12	13	14	13	21	20	18	19
Thallium	ug/L	2	< 2.0	< 2.0	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2

Notes:

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

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

NA - not applicable.

NU - sample results are unusable.

-- - not analyzed.

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

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

All metals were analyzed as total unless otherwise specified.

(1) April 2019 result not used for assessment monitoring.

(2) Due to anomalous chromium result and uncertainty that associated data quality objectives were met for the April 2019 analysis, a resample was collected June 21, 2019. The June 2019 result met data quality objectives and did not confirm the April 2019 result; therefore the June 2019 result is used for assessment monitoring in place of the April 2019 data.

(3) Total dissolved solids data for the October 2020 event contained errors introduced by the laboratory materials manufacturer and were determined to be unusable.

Table 1
Comparison of Groundwater Sampling Results to Groundwater Protection Standards for Statistical Evaluation
JH Campbell Landfill – RCRA CCR Monitoring Program
West Olive, Michigan

	Sample Location:		JHC-MW-15031							
	Sample Date:		4/24/2019	10/9/2019	4/14/2020	10/21/2020	4/13/2021	10/22/2021	4/12/2022	10/20/2022
Constituent	Unit	GWPS								
Appendix III										
Boron	ug/L	NA	79	85	75	114	51	64	58	56
Calcium	mg/L	NA	59	57	49.8	56.1	49.7	54.2	59.8	49.6
Chloride	mg/L	NA	24	28	20.1	25.0	9.49	7.56	10.4	3.28
Fluoride	ug/L	NA	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	NA	25	26	23.5	35.1	27.7	21.3	27.5	16.0
Total Dissolved Solids	mg/L	NA	280	220	266	NU(3)	180	< 10	220	215
pH, Field	SU	NA	6.9	6.9	6.7	6.4	7.1	7.3	7.1	7.5
Appendix IV										
Antimony	ug/L	**6**	< 1.0	< 1.0	< 1	< 1	< 1	< 1	< 1	< 1
Arsenic	ug/L	10	< 1.0	< 1.0	< 1	< 1	< 1	< 1	< 1	< 1
Barium	ug/L	2,000	14	17	17	20	15	15	14	12
Beryllium	ug/L	4	< 1.0	< 1.0	< 1	< 1	< 1	< 1	< 1	< 1
Cadmium	ug/L	5	< 0.20	< 0.20	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium	ug/L	100	5.4	1.9	< 1	3	< 1	< 1	1	< 1
Cobalt	ug/L	15	< 6.0	< 6.0	< 15	< 15	< 6	< 6	< 6	< 6
Fluoride	ug/L	4,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	15	< 1.0	< 1.0	< 1	< 1	< 1	< 1	< 1	< 1
Lithium	ug/L	40	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Mercury	ug/L	2	< 0.20	< 0.20	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Molybdenum	ug/L	100	< 5.0	< 5.0	< 5	< 5	< 5	< 5	< 5	< 5
Radium-226/228	pCi/L	5	0.466	0.798	< 0.412	< 0.412	< 0.502	< 0.435	< 0.456	< 0.576
Selenium	ug/L	50	< 1.0	< 1.0	2	3	3	3	3	2
Thallium	ug/L	2	< 2.0	< 2.0	< 2	< 2	< 2	< 2	< 2	< 2

Notes:

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

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

NA - not applicable.

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All metals were analyzed as total unless otherwise specified.

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(2) Due to anomalous chromium result and uncertainty that associated data quality objectives were met for the April 2019 analysis, a resample was collected June 21, 2019. The June 2019 result met data quality objectives and did not confirm the April 2019 result; therefore the June 2019 result is used for assessment monitoring in place of the April 2019 data.

(3) Total dissolved solids data for the October 2020 event contained errors introduced by the laboratory materials manufacturer and were determined to be unusable.

Table 1
Comparison of Groundwater Sampling Results to Groundwater Protection Standards for Statistical Evaluation
JH Campbell Landfill – RCRA CCR Monitoring Program
West Olive, Michigan

	Sample Location:		JHC-MW-15035									
		Sample Date:	4/24/2019	6/21/2019	6/21/2019	10/9/2019	4/14/2020	10/22/2020	4/14/2021	10/22/2021	4/12/2022	10/20/2022
Constituent	Unit	GWPS										
Appendix III					Field Dup							
Boron	ug/L	NA	91	--	--	78	64	60	52	73	81	59
Calcium	mg/L	NA	98	--	--	84	70.4	65.7	56.8	82.0	79.2	64.2
Chloride	mg/L	NA	23	--	--	24	15.0	10.9	9.07	14.0	9.35	7.98
Fluoride	ug/L	NA	< 1,000	--	--	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	NA	24	--	--	25	21.1	19.6	17.5	26.2	25.7	29.4
Total Dissolved Solids	mg/L	NA	360	--	--	370	300	NU[3]	240	365	320	272
pH, Field	SU	NA	7.2	7.1	--	7.2	7.2	7.2	7.3	7.2	7.2	7.4
Appendix IV												
Antimony	ug/L	**6**	< 1.0	--	--	< 1.0	< 1	< 1	< 1	< 1	< 1	**7**
Arsenic	ug/L	10	< 1.0	--	--	< 1.0	< 1	< 1	< 1	< 1	< 1	< 1
Barium	ug/L	2,000	17	--	--	16	17	13	12	19	17	14
Beryllium	ug/L	4	< 1.0	--	--	< 1.0	< 1	< 1	< 1	< 1	< 1	< 1
Cadmium	ug/L	5	< 0.20	--	--	< 0.20	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium	ug/L	100	290[1][2]	1.8[2]	2.5[2]	4.4	< 1	< 1	< 1	< 1	< 1	< 1
Cobalt	ug/L	15	< 6.0	--	--	< 6.0	< 15	< 15	< 6	< 6	< 6	< 6
Fluoride	ug/L	4,000	< 1,000	--	--	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	15	< 1.0	--	--	< 1.0	< 1	< 1	< 1	< 1	< 1	< 1
Lithium	ug/L	40	< 10	--	--	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Mercury	ug/L	2	< 0.20	--	--	< 0.20	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Molybdenum	ug/L	100	11	--	--	< 5.0	< 5	< 5	< 5	< 5	< 5	< 5
Radium-226/228	pCi/L	5	< 0.357	--	--	< 0.567	0.687	< 0.647	< 0.425	0.728	< 0.378	< 0.450
Selenium	ug/L	50	< 1.0	--	--	< 1.0	1	2	2	2	3	3
Thallium	ug/L	2	< 2.0	--	--	< 2.0	< 2	< 2	< 2	< 2	< 2	< 2

Notes:

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

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

NA - not applicable.

NU - sample results are unusable.

-- - not analyzed.

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

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All metals were analyzed as total unless otherwise specified.

(1) April 2019 result not used for assessment monitoring.

(2) Due to anomalous chromium result and uncertainty that associated data quality objectives were met for the April 2019 analysis, a resample was collected June 21, 2019. The June 2019 result met data quality objectives and did not confirm the April 2019 result; therefore the June 2019 result is used for assessment monitoring in place of the April 2019 data.

(3) Total dissolved solids data for the October 2020 event contained errors introduced by the laboratory materials manufacturer and were determined to be unusable.

Table 1
Comparison of Groundwater Sampling Results to Groundwater Protection Standards for Statistical Evaluation
JH Campbell Landfill – RCRA CCR Monitoring Program
West Olive, Michigan

		Sample Location:	JHC-MW-15036									
		Sample Date:	4/24/2019	10/8/2019	4/14/2020	10/22/2020	4/14/2021	10/22/2021	4/12/2022	4/12/2022	10/20/2022	10/20/2022
Constituent	Unit	GWPS										
Appendix III										Field Dup		Field Dup
Boron	ug/L	NA	80	71	77	81	80	76	94	94	48	48
Calcium	mg/L	NA	50	55	51.1	59.3	52.1	39.5	57.6	57.0	32.8	33.8
Chloride	mg/L	NA	14	13	8.51	10.4	9.50	5.71	9.20	9.13	9.60	9.66
Fluoride	ug/L	NA	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	NA	19	24	17.4	21.9	21.0	14.5	19.2	19.1	15.3	14.7
Total Dissolved Solids	mg/L	NA	220	320	221	NU(3)	229	169	238	246	163	164
pH, Field	SU	NA	7.4	7.5	7.3	7.3	7.1	7.6	7.4	--	7.3	--
Appendix IV												
Antimony	ug/L	**6**	< 1.0	< 1.0	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Arsenic	ug/L	10	< 1.0	< 1.0	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Barium	ug/L	2,000	8.4	9.4	9	9	8	7	9	10	6	6
Beryllium	ug/L	4	< 1.0	< 1.0	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Cadmium	ug/L	5	< 0.20	< 0.20	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium	ug/L	100	< 1.0	< 1.0	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Cobalt	ug/L	15	< 6.0	< 6.0	< 15	< 15	< 6	< 6	< 6	< 6	< 6	< 6
Fluoride	ug/L	4,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	15	< 1.0	< 1.0	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Lithium	ug/L	40	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Mercury	ug/L	2	< 0.20	< 0.20	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Molybdenum	ug/L	100	< 5.0	< 5.0	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Radium-226/228	pCi/L	5	< 0.384	0.442	0.659	< 0.554	< 0.486	< 0.386	< 0.395	< 0.398	< 0.616	0.591
Selenium	ug/L	50	< 1.0	1.9	< 1	< 1	< 1	1	2	2	< 1	< 1
Thallium	ug/L	2	< 2.0	< 2.0	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2

Notes:

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

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

NA - not applicable.

NU - sample results are unusable.

-- - not analyzed.

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

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All metals were analyzed as total unless otherwise specified.

(1) April 2019 result not used for assessment monitoring.

(2) Due to anomalous chromium result and uncertainty that associated data quality objectives were met for the April 2019 analysis, a resample was collected June 21, 2019. The June 2019 result met data quality objectives and did not confirm the April 2019 result; therefore the June 2019 result is used for assessment monitoring in place of the April 2019 data.

(3) Total dissolved solids data for the October 2020 event contained errors introduced by the laboratory materials manufacturer and were determined to be unusable.

Table 1
Comparison of Groundwater Sampling Results to Groundwater Protection Standards for Statistical Evaluation
JH Campbell Landfill – RCRA CCR Monitoring Program
West Olive, Michigan

		Sample Location:	JHC-MW-15037							
		Sample Date:	4/24/2019	10/8/2019	4/14/2020	10/22/2020	4/14/2021	10/22/2021	4/12/2022	10/20/2022
Constituent	Unit	GWPS								
Appendix III										
Boron	ug/L	NA	150	280	266	185	112	118	170	118
Calcium	mg/L	NA	73	110	100	93.4	59.0	61.7	85.1	52.3
Chloride	mg/L	NA	6.3	4.4	2.65	7.52	21.3	7.05	6.92	1.78
Fluoride	ug/L	NA	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	1,490	< 1,000	< 1,000
Sulfate	mg/L	NA	22	46	25.9	53.5	17.2	17.7	42.8	24.1
Total Dissolved Solids	mg/L	NA	270	400	385	NU(3)	254	249	359	270
pH, Field	SU	NA	7.3	7.3	7.1	7.0	6.7	7.2	7.2	6.7
Appendix IV										
Antimony	ug/L	**6**	< 1.0	< 1.0	< 1	< 1	< 1	< 1	< 1	< 1
Arsenic	ug/L	10	< 1.0	< 1.0	< 1	< 1	< 1	< 1	< 1	< 1
Barium	ug/L	2,000	9.7	14	15	14	10	11	18	12
Beryllium	ug/L	4	< 1.0	< 1.0	< 1	< 1	< 1	< 1	< 1	< 1
Cadmium	ug/L	5	< 0.20	< 0.20	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium	ug/L	100	1.7	1.2	< 1	< 1	< 1	< 1	1	< 1
Cobalt	ug/L	15	< 6.0	< 6.0	< 15	< 15	< 6	< 6	< 6	< 6
Fluoride	ug/L	4,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	1,490	< 1,000	< 1,000
Lead	ug/L	15	< 1.0	< 1.0	< 1	< 1	< 1	< 1	< 1	< 1
Lithium	ug/L	40	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Mercury	ug/L	2	< 0.20	< 0.20	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Molybdenum	ug/L	100	< 5.0	< 5.0	< 5	< 5	< 5	< 5	< 5	< 5
Radium-226/228	pCi/L	5	0.403	< 0.518	< 0.449	< 0.535	< 0.465	< 0.397	< 0.312	0.671
Selenium	ug/L	50	3.8	16	10	12	4	5	19	4
Thallium	ug/L	2	< 2.0	< 2.0	< 2	< 2	< 2	< 2	< 2	< 2

Notes:

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

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

NA - not applicable.

NU - sample results are unusable.

-- - not analyzed.

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(3) Total dissolved solids data for the October 2020 event contained errors introduced by the laboratory materials manufacturer and were determined to be unusable.

Table 1

Comparison of Groundwater Sampling Results to Groundwater Protection Standards for Statistical Evaluation
JH Campbell Landfill – RCRA CCR Monitoring Program
West Olive, Michigan

		Sample Location:	MW-B3		MW-B4	
		Sample Date:	4/12/2022	10/20/2022	4/12/2022	10/20/2022
Constituent	Unit	GWPS				
Appendix III						
Boron	ug/L	NA	92	74	178	274
Calcium	mg/L	NA	95.8	70.1	52.5	83.5
Chloride	mg/L	NA	6.65	24.2	19.6	34.5
Fluoride	ug/L	NA	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	NA	24.1	73.8	18.5	28.9
Total Dissolved Solids	mg/L	NA	348	383	245	410
pH, Field	SU	NA	6.5	6.1	7.2	6.9
Appendix IV						
Antimony	ug/L	**6**	1	< 1	< 1	< 1
Arsenic	ug/L	10	< 1	< 1	< 1	< 1
Barium	ug/L	2,000	70	69	29	54
Beryllium	ug/L	4	< 1	< 1	< 1	< 1
Cadmium	ug/L	5	< 0.2	< 0.2	< 0.2	< 0.2
Chromium	ug/L	100	1	< 1	2	< 1
Cobalt	ug/L	15	< 6	< 6	< 6	< 6
Fluoride	ug/L	4,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	15	< 1	< 1	< 1	< 1
Lithium	ug/L	40	12	12	< 10	< 10
Mercury	ug/L	2	< 0.2	< 0.2	< 0.2	< 0.2
Molybdenum	ug/L	100	< 5	< 5	< 5	< 5
Radium-226/228	pCi/L	5	0.558	< 0.571	< 0.410	< 0.486
Selenium	ug/L	50	29	7	4	2
Thallium	ug/L	2	< 2	< 2	< 2	< 2

Notes:

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

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

NA - not applicable.

NU - sample results are unusable.

-- - not analyzed.

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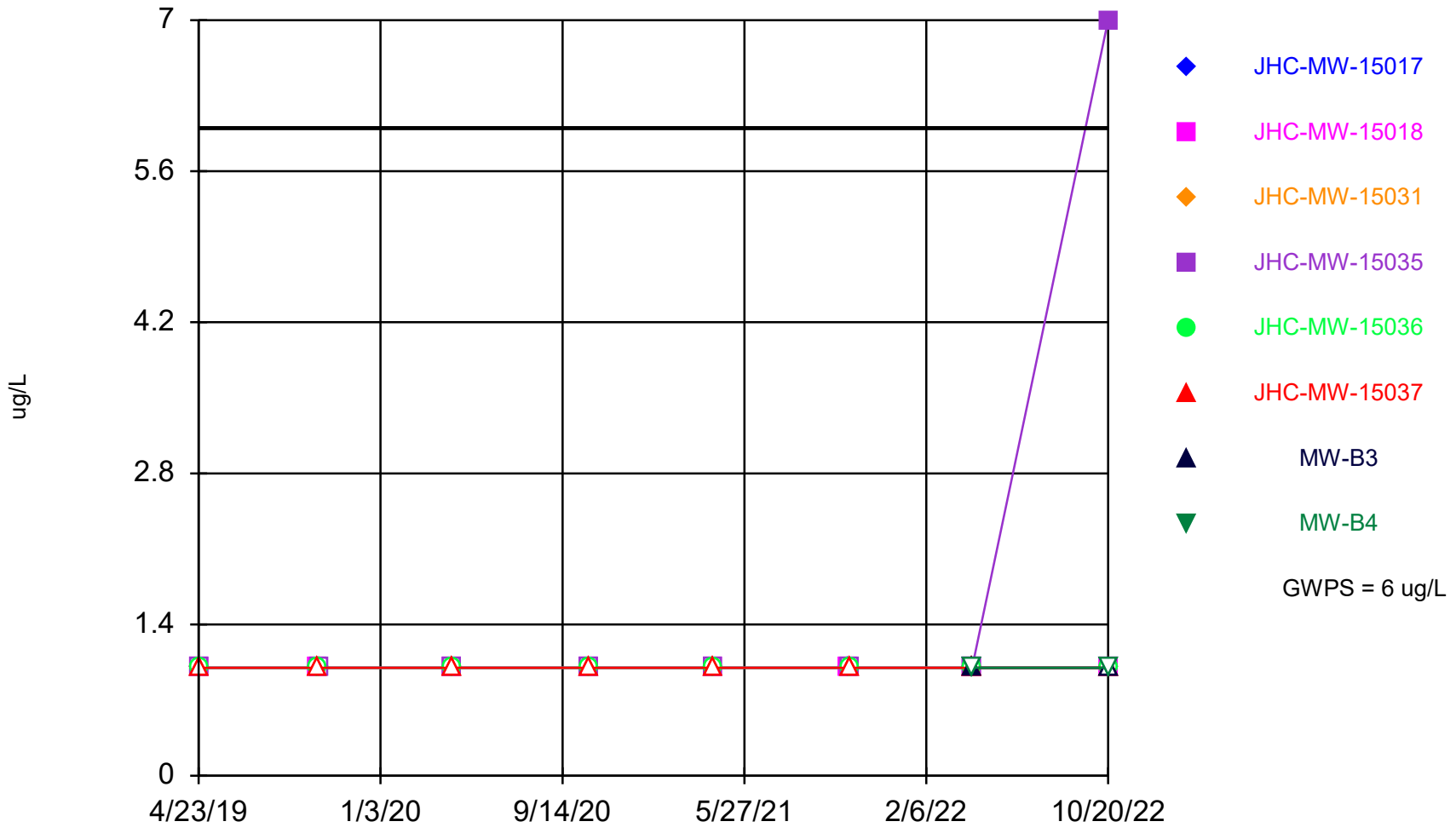
(3) Total dissolved solids data for the October 2020 event contained errors introduced by the laboratory materials manufacturer and were determined to be unusable.

Attachment 1
Sanitas™ Output

Hollow symbols indicate censored values.

Antimony Comparison to GWPS



Time Series Analysis Run 11/23/2022 11:39 AM

Client: Consumers Energy Data: JHC_CCR Sanitas_4Q22

Summary Report

Constituent: Antimony, Total Analysis Run 11/23/2022 11:40 AM
Client: Consumers Energy Data: JHC_CCR Sanitas_4Q22

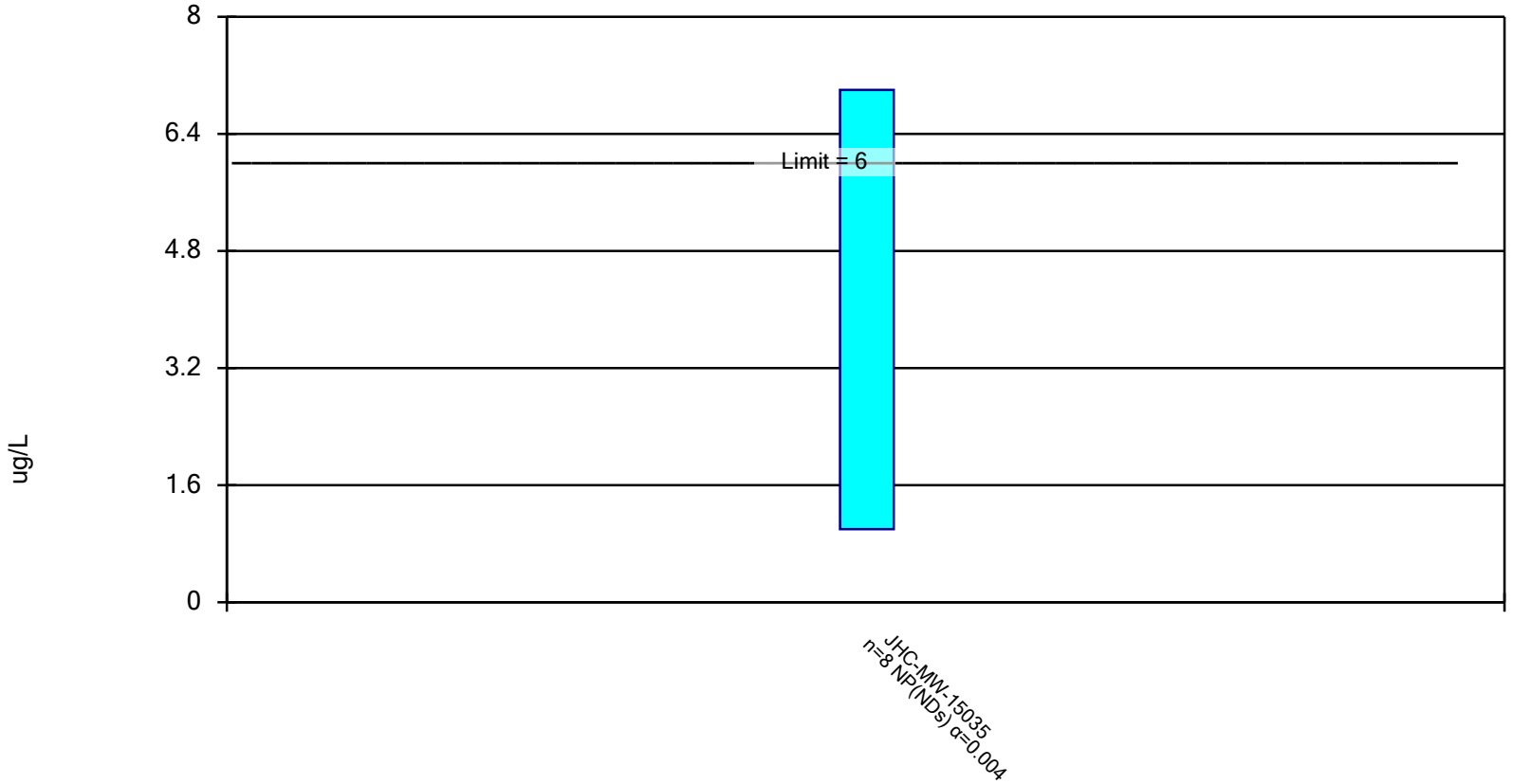
For observations made between 4/23/2019 and 10/20/2022, a summary of the selected data set:

Observations = 52
NDs = 96%
Wells = 8
Minimum Value = 1
Maximum Value = 7
Mean Value = 1.115
Median Value = 1
Standard Deviation = 0.8321
Coefficient of Variation = 0.746
Skewness = 7.001

Well	#Obs.	NDs	Min	Max	Mean	Median	Std.Dev.	CV	Skewness
JHC-MW-15017	8	100%	1	1	1	1	0	0	NaN
JHC-MW-15018	8	100%	1	1	1	1	0	0	NaN
JHC-MW-15031	8	100%	1	1	1	1	0	0	NaN
JHC-MW-15035	8	87%	1	7	1.75	1	2.121	1.212	2.268
JHC-MW-15036	8	100%	1	1	1	1	0	0	NaN
JHC-MW-15037	8	100%	1	1	1	1	0	0	NaN
MW-B3	2	50%	1	1	1	1	0	0	NaN
MW-B4	2	100%	1	1	1	1	0	0	NaN

Non-Parametric Confidence Interval

Compliance Limit is not exceeded.



Constituent: Antimony, Total Analysis Run 11/23/2022 11:30 AM

Client: Consumers Energy Data: JHC_CCR Sanitas_4Q22

Confidence Interval

Constituent: Antimony, Total (ug/L) Analysis Run 11/23/2022 11:31 AM

Client: Consumers Energy Data: JHC_CCR Sanitas_4Q22

	JHC-MW-15035
4/24/2019	<1
10/9/2019	<1
4/14/2020	<1
10/22/2020	<1
4/14/2021	<1
10/22/2021	<1
4/12/2022	<1
10/20/2022	7
Mean	1.75
Std. Dev.	2.121
Upper Lim.	7
Lower Lim.	1