July 30, 2021 ***TRANSMITTAL VIA EMAIL 07/30/2021***

Ms. Lori Babcock
Michigan Department of Environment, Great Lakes, and Energy
Materials Management Division
Saginaw Bay District Office
401 Ketchum St, Suite B
Bay City, Michigan 48708

SUBJECT: Semiannual Progress Report – Selection of Final Remedy pursuant to §257.97(a)
JC Weadock Bottom Ash Pond and Landfill Coal Combustion Residuals (CCR) Units

Dear Ms. Babcock,

Consumers Energy prepared and submitted to the Michigan Department of Environment, Great Lakes, and Energy (EGLE) a closure work plan for the Weadock Bottom Ash Pond (Weadock Bottom Ash Pond Work Plan) and a Response Action Plan developed for the Weadock Bottom Ash Pond and Weadock Landfill in accordance with Part 115 dated November 30, 2018 and March 15, 2019, respectively. These plans were developed in anticipation of supporting the Assessment of Corrective Measures that would be necessary for evaluating and selecting a remedy for the Weadock Bottom Ash Pond and Weadock Landfill. Consumers Energy provided notification of exceeding a Groundwater Protection Standard (GWPS) per §257.95(g), which documented that beryllium and lithium were present at statistically significant levels above the GWPS in one downgradient well at the Weadock Bottom Ash Pond and arsenic was present at one downgradient monitoring well in the original Weadock Landfill groundwater monitoring system on January 14, 2019.

EGLE approved the Weadock Bottom Ash Pond Work Plan on December 20, 2018, based on expectation that a report documenting the removal activities and certifying solid waste has been removed in accordance with the work plan would be submitted at the completion of activities. Subsequently, EGLE approved the Response Action Plan on May 14, 2019, based on the anticipated submittal of the Assessment of Corrective Measures. Consumers Energy has completed the excavation activities described in the Weadock Bottom Ash Pond Work Plan and submitted a final excavation certification report by August 26, 2020, to satisfy requirements for completing the removal of solid waste which rendered the need for a solid waste operating license was unnecessary. The certification of solid waste removal was approved by EGLE on December 1, 2020.

The certification report satisfied requirements under the response action plan to remove identified sources of contamination on a schedule that required consideration of

concentrations of hazardous substances, rate of migration, and risks to human health and the environment. Additional steps needed to address residual groundwater contamination are discussed in the observations and results sections below.

For the Weadock Landfill, Consumers Energy completed construction of a soil-bentonite slurry wall (Weadock Slurry Wall) that enclosed the landfill with the exception of a 1,600 ft venting feature (NTH Consultants, Ltd., 2009). Later, construction of the Weadock Slurry Wall was extended to include the previous vent (Golder, 2018). EGLE approved the construction certification reports on June 24, 2009 and December 19, 2018, respectively. Groundwater monitoring performed since the initial soil-bentonite slurry wall construction has demonstrated the effectiveness of mitigating the migration of impacted groundwater past the solid waste boundary from measurements of paired groundwater monitoring wells and piezometers installed along the perimeter of the solid waste boundary containing the sol-bentonite slurry wall. Additionally, water quality monitoring has generally demonstrated improvement in groundwater concentrations of arsenic above the groundwater protection standards.

This Semiannual Progress Report, prepared as a requirement of §257.97(a) of the Federal Coal Combustion Residual (CCR) Rule, describes progress towards selecting and implementing the final remedy for the Weadock Bottom Ash Pond and Weadock Landfill after the completion of the *Assessment of Corrective Measures, JC Weadock Bottom Ash Pond and Landfill Coal Combustion Residual Unit*, dated September, 11, 2019 (Weadock ACM) (TRC, 2019). Groundwater management alternatives considered to be technically feasible following source removal activities for the Weadock Bottom Ash Pond that could potentially address the residual arsenic under ***known*** groundwater conditions were identified in the report as: 1) Source removal with post-remedy monitoring, 2) Source removal with groundwater capture/control, 3) Source removal with impermeable barrier, 4) Source removal with active geochemical sequestration, and 5) Source removal with passive geochemical sequestration. These groundwater corrective strategies also apply to the Weadock Landfill upon completing source containment through the construction of the soil-bentonite slurry wall and construction of an impermeable final cover system.

Results of May 2021 Sampling Event

Statistical analysis from the May 2021 assessment groundwater monitoring event verified that the that there were no constituents of concern present at statistically significant levels above the established Groundwater Protection Standard (GWPS) within the Weadock Bottom Ash Pond groundwater monitoring system and only one monitoring well within the Weadock Landfill groundwater monitoring system where arsenic is present at statistically significant levels exceeding the GWPS. Results are presented in *May 2021 Assessment Monitoring Data Summary and Statistical Evaluation Consumers Energy, JC Weadock Site Bottom Ash Pond*

CCR Unit (May 2021 Event Summary) (TRC, 2021) and *2021 Semiannual Groundwater Monitoring Report and Second Quarter 2021 Hydrogeological Monitoring Report, JC Weadock Solid Waste Disposal Area* (2Q2021 Quarterly Monitoring Report) submitted under a separate cover. Additionally, monitoring performed under the Weadock Groundwater Surface-Water Interface (GSI) Compliance Plan demonstrates protection of human health and the environment with criteria determined to be protective at the point of exposure.

Significant observations from the event summary are as follows:

- Beryllium and lithium are no longer present at statistically significant levels in the Weadock Bottom Ash Pond groundwater monitoring system, leaving only arsenic present in one monitoring well within the Weadock Landfill groundwater monitoring well system present at statistically significant levels;
- No additional Appendix IV constituents have been observed at statistically significant levels above GWPS for the Weadock Bottom Ash Pond or Weadock Landfill groundwater monitoring systems;
- Arsenic is present at a statistically significant levels above the GWPS at JCW-MW-18006; however, this well is located adjacent to dewatering and excavation work for the Weadock Bottom Ash Pond and expected to demonstrate improvement since the source removal work was completed in 2020; and
- Arsenic and molybdenum concentrations at monitoring well MW-55 have been reviewed through an Alternate Source Demonstration indicating elevated levels of constituents at that location are not related to materials management of the Weadock Landfill.

Conclusions

Source removal activities for the Weadock Bottom Ash Pond have been completed and were documented in the Weadock Bottom Ash Pond Closure Report submitted to EGLE on August 26, 2020. Improvements in groundwater quality have been observed in the groundwater monitoring system, but observations of ongoing changes in groundwater potentiometric surface that may influence groundwater flow characteristics and/or alter groundwater redox conditions at monitoring locations that could influence constituent concentrations still require further evaluation before a final remedy can be selected. Subsequent sampling events will inform the on-going improvements and retention of monitoring-only, passive, or active remedial options following the source removal. As conditions continue to be evaluated post-source removal, the drinking water and groundwater-surface water interface (GSI) pathway are protected by quarterly monitoring performed under the Michigan-approved hydrogeological monitoring plan that includes a GSI Compliance Monitoring Program.

The final remedy for the Weadock Bottom Ash Pond and Weadock Landfill will be formally selected per §257.97 and Michigan Solid Waste requirements once the selected option is reviewed and commented on by EGLE and a public meeting is conducted at least 30-days prior to the final selection as required under §257.96(e).

The next semiannual progress report will be submitted in six months by January 31, 2022. Please feel free to contact me with any questions or clarifications.

Sincerely,

Harold D. Register, Jr., P.E.
Principal Engineer
Landfill Operations Compliance
Phone: (517) 788-2982
Email: harold.registerjr@cmsenergy.com

cc: Mr. Phil Roycraft, EGLE Saginaw Bay District Office
Mr. Gary Schwerin, EGLE Saginaw Bay District Office
Ms. Margie Ring, EGLE Lansing Office
Mr. Jim Arduin, EGLE Lansing Office
Mr. Caleb Batts, Consumers Energy
Ms. Darby Litz, TRC

Enclosure: *May 2021 Assessment Monitoring Data Summary and Statistical Evaluation Consumers Energy, JC Weadock Site, Landfill and Bottom Ash Pond CCR Units*. (TRC, July 30, 2021).

May 2021 Assessment Monitoring Data Summary and Statistical Evaluation

JC Weadock, Bottom Ash Pond CCR Unit

Essexville, Michigan

July 2021

Prepared For:

Consumers Energy Company

Prepared By:

TRC
1540 Eisenhower Place
Ann Arbor, Michigan 48108

Darby Litz
Hydrogeologist/Project Manager

Jake Krenz
Staff Geologist

TABLE OF CONTENTS

TABLES

FIGURES

APPENDICES

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), as amended. Standards for groundwater monitoring and corrective action codified in the CCR Rule (40 CFR 257.90 – 257.98) apply to the JC Weadock Bottom Ash Pond CCR Unit (Weadock Bottom Ash Pond).

Consumers Energy is continuing assessment monitoring in accordance with §257.95 of the CCR Rule for the Weadock Bottom Ash Pond in Essexville, Michigan (Figure 1). This monitoring report has been prepared to provide the summary of the May 2021 assessment groundwater monitoring results, data quality review, and statistical data evaluation for the Weadock Bottom Ash Pond groundwater monitoring systems.

1.1 Program Summary

Groundwater monitoring for the Weadock Bottom Ash Pond commenced after the installation of the monitoring well network in December 2015 to establish background conditions. Detection monitoring was initiated on October 17, 2017 in conformance with the self-implementing schedule in the CCR Rule.

Consumers Energy first reported the potential for statistically significant increases (SSIs) for Appendix III constituents in the *Annual Groundwater Monitoring Report JC Weadock Power Plant Bottom Ash Pond CCR Unit* (TRC, January 2018). The statistical evaluation of the Appendix III indicator parameters confirming SSIs over background were as follows:

- Boron at JCW-MW-15010;
- Calcium at JCW-MW-15009;
- Field pH at JCW-MW-15009 (low), JCW-MW-15010 (high), JCW-MW-15028 (high); and
- Sulfate at JCW-MW-15009.

On April 25, 2018, Consumers Energy entered assessment monitoring upon determining that an Alternate Source Demonstration for the Appendix III constituents was not successful. On January 14, 2019, Consumers Energy provided notification that beryllium and lithium were present at statistically significant levels above the Groundwater Protection Standards (GWPSs) in one of the downgradient monitoring wells at the Weadock Bottom Ash Pond. The notification of the GWPS exceedance was followed up with a Response Action Plan Submitted to the Michigan Department of Environment, Great Lakes, and Energy (EGLE) on March 15, 2019 laying out the preliminary understanding of water quality and actions that were underway to mitigate or eliminate unacceptable risk associated with the identified release from the CCR unit. The *Assessment of Corrective Measures* (ACM) (TRC, September 2019) was submitted on September 11, 2019 in accordance with the schedule in §257.96 and the requirements of the Response Action Plan.

The ACM documents that the groundwater nature and extent has been defined, as required in §257.95(g)(1). Although site-specific constituents of concern (COCs) (i.e., arsenic [Weadock Landfill], beryllium and lithium [Weadock Bottom Ash Pond]) have been identified in

groundwater monitoring locations at concentrations exceeding their respective GWPS, COCs are delineated within the limits of the property owned by Consumers Energy and there are currently no adverse effects on human health or the environment from either surface water or groundwater due to CCR management at the Weadock Bottom Ash Pond.

Evaluation of groundwater under the CCR Rule focuses on the following constituents that are collected unfiltered in the field:

CCR Rule Monitoring Constituents		
Appendix III	**Appendix IV**	
Boron	Antimony	Mercury
Calcium	Arsenic	Molybdenum
Chloride	Barium	Radium 226/228
Fluoride	Beryllium	Selenium
pH	Cadmium	Thallium
Sulfate	Chromium	
Total Dissolved Solids (TDS)	Cobalt	
	Fluoride	
	Lead	
	Lithium	

Prior to remedy selection, Consumers Energy will also collect a sufficient number of samples to evaluate Michigan state-specific constituents as follows:

Additional Monitoring Constituents (Michigan Part 115/PA 640[1])	
Detection Monitoring	**Assessment Monitoring**
Iron	Copper
	Nickel
	Silver
	Vanadium
	Zinc

[1] On December 28, 2018, the State of Michigan enacted Public Act No. 640 of 2018 (PA 640) to amend the Natural Resources and Environmental Protection Act, also known as Part 115 of PA 451 of 1994, as amended (a.k.a., Michigan Part 115 Solid Waste Management). The December 2018 amendments to Part 115 were developed to provide the State of Michigan oversight of CCR impoundments and landfills and to better align existing state solid waste management rules and statutes with the CCR Rule.

Consumers Energy will continue to evaluate corrective measures for the Weadock Bottom Ash Pond per §257.96 and §257.97 and is continuing semiannual assessment monitoring in accordance with §257.95.

1.2 Site Overview

The Weadock Bottom Ash Pond is located within the JC Weadock Power Plant site, which is located south of the DE Karn Power Plant site, east of the Saginaw River, west of Underwood Drain and Saginaw Bay, and north of Tacey Drain and agricultural land (Figure 1). The Weadock Bottom Ash Pond is located immediately west of the JC Weadock Solid Waste Disposal Area (*i.e.* Weadock Landfill) and outside of the soil-bentonite slurry wall (Figure 2). The Weadock Landfill is being monitored in accordance with the EGLE-approved *Landfill Hydrogeological Monitoring Plan*, JC Weadock Solid Waste Disposal Area (February 2021). In addition to the Weadock Bottom Ash Pond and Weadock Landfill, the Site consists of the generating facility which retired eight coal-fired generating units and infrastructure and utilities that support electrical transmission. Units 1 to 6 commenced operation in 1940 and retired in 1980 and Units 7 and 8 were added in 1955 and 1958 continued to operate through April 15, 2016.

The Weadock Bottom Ash Pond was formerly the primary settling/detention structure for the National Pollutant Discharge Elimination System (NPDES) Treatment System prior to discharge and characterized as an existing CCR surface impoundment. Consumers Energy ceased hydraulic loading to the Weadock Bottom Ash Pond in April 2018 and has allowed the area to dewater by gravity. The active dewatering and excavation work was completed between February and July 2020. The excavation extended to six inches below known CCR elevations established from previous investigations. Excavated CCR has been placed in the neighboring Weadock Landfill that is constructed with of a fully encapsulation soil-bentonite slurry wall keyed into a competently confining clay unit. The Weadock Bottom Ash Pond has been restored by backfilling and grading the surface with clean fill in accordance with the plan to promote stormwater drainage, minimize ponding of surface water, and to reduce the potential of infiltration and migration of residual arsenic and any future COCs. Consumers Energy submitted for review and approval, *J.C. Weadock Generating Facility Bottom Ash Pond CCR Removal Documentation Report* (Weadock Bottom Ash Pond Closure Report) on August 26, 2020 to satisfy requirements for completing the removal of solid waste which rendered the need for a solid waste operating license unnecessary. EGLE approved the removal documentation report satisfying state requirements to close on December 1, 2020. Groundwater conditions post-CCR removal continue to be monitored.

1.3 Geology/Hydrogeology

The majority of Weadock Bottom Ash Pond area is comprised of surficial CCR and sand fill. USGS topographic maps and aerial photographs dating back to 1938, in addition to field descriptions of subsurface soil at the site, indicate that the site was largely developed by reclaiming low-lands through construction of perimeter dikes and subsequent ash filling.

The surficial fill consists of a mixture of varying percentages of ash, sand, and clay-rich fill ranging from 5 to 15 feet thick. Below the surficial fill, native alluvium and lacustrine soils are

present at varying depths. Generally, there is a well graded sand unit present to depths of 10 30 feet below ground surface (ft bgs) overlying a clay till which is observed at depths ranging from 25 to 75 ft bgs. A sandstone unit, which is part of the Saginaw formation, was generally encountered at 80-90 ft bgs. In general, the alluvium soils (sands) are deeper along the Saginaw River and there are shallower lacustrine deposits (clays, silts, and sands deposited in or on the shores of glacial lakes) at other areas. Along the perimeter of the landfill, there is a well graded sand present at depths ranging from 10 to 20 ft-bgs. The sand is variable in thickness, ranging from <1 to ~6.5 feet, and is discontinuous along the perimeter, as evidenced by the soil boring logs and slurry wall construction documentation.

The alluvium soils pinch out and are not observed in soil borings located south and east of the Weadock Bottom Ash Pond and Weadock Landfill, along the location of the historic shoreline. The non-water-bearing region south of these units extends for at least a mile south and southeast of the site.

Beneath the surficial fill and sand unit (where present) is 70 to 80 feet of clay till. Along the southern perimeter of the landfill, some of the upper portion of the clay till is sand-rich (generally greater than 20 ft-bgs). The clay till acts as a hydraulic barrier that separates the shallow groundwater from the underlying sandstone. The sandstone unit, which is part of the Saginaw Formation, is generally encountered at 80-90 ft-bgs.

The Weadock Bottom Ash Pond and Weadock Landfill are bounded by several surface water features (Figure 1): the Saginaw River to the west, a discharge channel and Saginaw Bay (Lake Huron) to the north, Underwood Drain to the east, and Tacey Drain to the south. Groundwater flow in the upper aquifer is largely controlled by the surface water elevations of Saginaw River and Saginaw Bay. In general, shallow groundwater is encountered at a similar or slightly higher elevation relative to the surrounding surface water features. The shallow groundwater flow direction in the vicinity of the Weadock Bottom Ash Pond is to the north toward the discharge channel and to the east toward the Saginaw River. Historical groundwater flow beneath the Weadock Landfill was directed north to the discharge channel due to the bentonite/soil slurry wall. Originally, the slurry wall enclosed the historical fly ash disposal area with the exception of a small segment along the perimeter dike that is designed to vent along the discharge channel immediately upgradient from the NPDES external outfall to prevent water from building up within the facility. In July 2018, this vent was closed and the slurry wall reduced porewater flux around the entire perimeter of the landfill. Following the closure of the vent, the static water level elevations inside of the slurry wall are generally significantly different (>1 ft) than static water levels outside of the slurry wall, which demonstrates the presence of a low permeability feature between the well pairs.

In previous investigations, bedrock groundwater was generally encountered around 578 ft (NAVD88), which is several feet lower than the shallow groundwater. Groundwater flow direction was generally to the northeast under a very shallow gradient. Given the different groundwater flow regime in the bedrock than the shallow saturated unit, bedrock wells near the surface water bodies are several feet below the surface water elevation. Based on the fact that the shallow sand and the bedrock are separated by over 50 ft of clay, the bedrock unit does not appear to be hydraulically connected to the shallow sand.

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 Weadock Bottom Ash Pond, which consists of eight monitoring wells (four background monitoring wells and four downgradient monitoring wells) that are screened in the uppermost aquifer. The monitoring well locations are shown on Figure 2.

Groundwater around the Weadock Bottom Ash Pond was characterized as radial based on the eight initial background sampling events prior to commencing detection monitoring; therefore, the four downgradient wells (JCW-MW-15007, JCW-MW-15009, JCW-MW-15010, and JCW-MW-15028) were installed in the accessible areas along the perimeter of the Weadock Bottom Ash Pond. Following the cessation of hydraulic loading, groundwater near the Weadock Bottom Ash Pond continues to flow to the north toward the discharge channel and to the west near the Saginaw River; therefore, the compliance wells continue to accurately represent the quality of groundwater passing the waste boundary that ensures detection of groundwater contamination such that all potential contaminant pathways are monitored.

Four monitoring wells located south of the Weadock Bottom Ash Pond provide data on background groundwater quality that has not been impacted by a CCR unit (MW-15002, MW-15008, MW-15016, and MW-15019). Analysis for the establishment of these wells as background is detailed in the *Groundwater Statistical Evaluation Plan* (Stats Plan) for the Weadock Bottom Ash Pond, dated October 17, 2017.

2.2 May 2021 Assessment Monitoring

Per §257.95, all wells in the CCR unit monitoring program must be sampled at least semiannually. TRC conducted the first semiannual assessment monitoring event of 2021 for Appendix III and IV constituents at Bottom Ash Pond CCR Unit in accordance with the *JC Weadock Monitoring Program Sample Analysis Plan* (TRC, 2018) (SAP). The semiannual assessment monitoring event was performed on May 3 through 12, 2021. The Bottom Ash Pond downgradient monitoring well network (JCW-MW-15007, JCW-MW-15009, JCW-MW-15010, and JCW-MW-15028), and background monitoring wells (MW-15002, MW-15008, MW-15016, and MW-15019) were sampled during the semiannual assessment monitoring event. The locations of the monitoring wells are depicted on Figure 2.

The May 2021 sampling event consisted of collecting static water level measurements from the Weadock Bottom Ash Pond groundwater monitoring system. Static water level measurements were also collected at other site wells to support preparation of a groundwater contour map. Static water elevation data are summarized in Table 1 and groundwater elevation data are shown on Figure 3. Monitoring wells were purged with peristaltic pumps utilizing low-flow sampling methodology. Field parameters were stabilized at each monitoring well prior to collecting groundwater samples. Stabilized field parameters for each monitoring well are summarized in Table 2.

Eurofins TestAmerica Inc. (TestAmerica) in St. Louis, Missouri, provided the radiological analysis of the groundwater samples. The remaining Appendix III and IV constituents were analyzed by Consumers Energy Laboratory Services in Jackson, Michigan in accordance with the SAP. The analytical results for the background monitoring wells are summarized in Table 3. The analytical results for the Bottom Ash Pond downgradient monitoring wells are summarized in Table 4.

2.2.1 Groundwater Flow Rate and Direction

Groundwater elevation data collected during the May 2021 assessment monitoring event are provided in Table 1. These data were used to construct the groundwater contour map (Figure 3). Groundwater elevations at the Weadock site are generally within the range of 581 to 594 feet above mean sea level (ft NAVD88) and groundwater is typically encountered at a similar or slightly higher elevation relative to the surrounding surface water features measured by the NOAA gauging station data.

Figure 3 shows that groundwater near the Weadock Bottom Ash Pond continues to flow to the north toward the discharge channel and to the west near the Saginaw River. The average hydraulic gradient throughout the bottom ash pond area during the May 2021 event is estimated at 0.0030 ft/ft. The gradient was calculated using the monitoring well pairs JCW-MW-15028/JCW-MW-15009, JCW-MW-15007/JCW-MW-15010, and MW-15016/MW-15002. Using the mean hydraulic conductivity of 16 ft/day (ARCADIS, 2016) and an assumed effective porosity of 0.3, the estimated seepage velocity observed in May 2021 (0.16 ft/day or 59 ft/year). The general flow direction is similar to that identified in previous monitoring rounds and continues to demonstrate that the downgradient monitoring wells are appropriately positioned to detect the presence of Appendix III/IV constituents that could potentially migrate from the Weadock Bottom Ash Pond.

2.2.2 Data Quality

Data was evaluated for completeness, overall quality and usability, method-specified sample holding times, precision and accuracy, and potential sample contamination. Analytical data were found to be usable for assessment monitoring and were generally consistent with previous sampling events. The Data Quality Reviews are included as Appendix A.

3.0 Assessment Monitoring Statistical Evaluation

Assessment monitoring is continuing at the Weadock Bottom Ash Pond while corrective measures are further evaluated in accordance with §257.96 and §257.97 as outlined in the ACM. The following section summarizes the statistical approach applied to assess the May 2021 groundwater data in accordance with the assessment monitoring program.

3.1 Establishing Groundwater Protection Standards

The 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. In accordance with §257.95(h) and the Stats Plan, GWPSs were established for the Appendix IV constituents following the preliminary assessment monitoring event as documented in the Groundwater Protection Standards technical memorandum (Appendix C of the *2018 Annual Groundwater Monitoring Report* (TRC, January 2019). The GWPS is established as the higher value of the EPA Maximum Contaminant Level (MCL) or statistically derived background level for constituents with MCLs and the higher of the EPA Regional Screening Levels (RSLs) or background level for constituents without an established MCL.

3.2 Data Comparison to Groundwater Protection Standards

The compliance well groundwater concentrations for Appendix IV constituents were compared to the GWPSs to determine if a statistically significant exceedance had occurred in accordance with §257.95. 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 monitoring well data exceeds the GWPS for any Appendix IV constituent. As documented in the January 14, 2019 *Notification of Appendix IV Constituent Exceeding Groundwater Protection Standard per §257.95(g)*, beryllium and lithium were present at statistically significant levels above the federal GWPS in one downgradient monitoring well within the Weadock Bottom Ash Pond groundwater monitoring system.

Confidence intervals were established per the statistical methods detailed in the *Statistical Evaluation of May 2021 Assessment Monitoring Sampling Event* technical memorandum provided in Appendix B. For each Appendix IV constituent, the concentrations were first compared directly to the respective GWPSs. Constituent-well combinations that included a direct exceedance of the GWPSs were retained for further statistical analysis using confidence limits.

Overall, the assessment monitoring statistical evaluations have confirmed that beryllium, and lithium are the only Appendix IV constituents that have been present at statistically significant levels above the GWPS. The statistical evaluation of this semiannual assessment monitoring event data indicate that no appendix IV constituents are present at statistically significant levels exceeding the GWPS in downgradient monitoring wells at the Weadock Bottom Ash Pond:

Constituent	GWPS	#Downgradient Wells Observed

No constituents are present at statistically significant levels exceeding the GWPS

Previously, beryllium and lithium at JCW-MW-15009 were present at a statistically significant levels; however, the May 2021 statistical evaluations show that the lower confidence limit for all Appendix IV constituents are below their respective GWPSs. Source removal of CCR has been completed, as reported in the *Weadock Bottom Ash Pond Removal Documentation Report* (Golder, August 2020) and approved by the EGLE on December 18, 2020. Lithium and beryllium concentrations have been below the GWPS at JCW-MW-15009 for the past four semi-annual sampling events. Assessment monitoring will continue while Consumers Energy continues to evaluate corrective measures per §257.96 and §257.97. A summary of the confidence intervals for May 2021 is provided in Table 5.

4.0 Conclusions and Recommendations

Corrective action has been triggered and assessment monitoring is ongoing at the Weadock Bottom Ash Pond CCR unit. A summary of the May 2021 assessment monitoring event is presented in this report. Overall, the statistical assessments have confirmed that beryllium and lithium are the only Appendix IV constituents present at statistically significant levels above the GWPS. Consumers Energy has completed the removal of CCR consistent with the timeline for closure of the Weadock Bottom Ash Pond under the *J.C. Weadock Generating Facility Bottom Ash Pond Closure Plan* (Golder, January 2018) and the CCR Rule's closure by removal provisions in §257.102(c).

Consumers Energy will continue assessment monitoring and evaluate corrective measures in accordance with §257.96 and §257.97 as outlined in the Weadock ACM. The groundwater management remedy for the Weadock Bottom Ash Pond will be selected as soon as feasible to meet the federal standards of §257.96(b). Consumers Energy will continue the assessment of corrective measures, per §257.95(g), and execute the self-implementing groundwater compliance schedule in conformance with §257.90 - §257.98. The next semiannual monitoring event is tentatively scheduled for the fourth calendar quarter of 2021.

5.0 References

ARCADIS. May 13, 2016. Summary of Monitoring Well Design, Installation, and Development. JC Weadock Electric Generation Facility – Essexville, Michigan. Prepared for Consumers Energy Company.

ARCADIS. May 18, 2016. Electric Generation Facilities RCRA CCR Detection Monitoring Program. JC Weadock Monitoring Program Sample Analysis Plan, Essexville, Michigan. Prepared for Consumers Energy Company.

Consumers Energy Company. January 2019. Notification of Appendix IV Constituent Exceeding Groundwater Protection Standards per §257.95(g).

Golder Associates Inc. January 2018. J.C. Weadock Generating Facility Bottom Ash Pond Closure Plan, Essexville, Michigan. Prepared for Consumers Energy Company.

Golder Associates Inc. August 2020. J.C. Weadock Generating Facility Bottom Ash Pond CCR Removal Documentation Report, Essexville, Michigan. Prepared for Consumers Energy Company.

TRC. October 2017. Groundwater Statistical Evaluation Plan – JC Weadock Power Plant, Bottom Ash Pond, Essexville, Michigan. Prepared for Consumers Energy Company.

TRC Environmental Corporation. January 2018. Annual Groundwater Monitoring Report – JC Weadock Power Plant, Bottom Ash Pond CCR Unit. Prepared for Consumers Energy Company.

TRC Environmental Corporation. January 2019. 2018 Annual Groundwater Monitoring Report – JC Weadock Power Plant, Bottom Ash Pond CCR Unit. Prepared for Consumers Energy Company.

TRC. September 2019. Assessment of Corrective Measures – JC Weadock Bottom Ash Pond and Landfill Coal Combustion Residual Units. 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: May 2021
Second Quarter 2021 Quarterly Report
JC Weadock Solid Waste Disposal Area, Essexville, Michigan

Well Location	TOC Elevation (ft)	Geologic Unit of Screen Interval	Screen Interval Elevation (ft)			May 3, 2021	
						Depth to Water (ft BTOC)	Groundwater Elevation (ft)
Background Monitoring Wells							
MW-15002	587.71	Sand	580.9	to	570.9	6.56	581.15
MW-15008	585.36	Sand with clay	578.7	to	568.7	4.13	581.23
MW-15016	586.49	Sand	581.2	to	578.2	4.38	582.11
MW-15019	586.17	Sand and Sand/Clay	579.5	to	569.5	4.85	581.32
Bottom Ash Pond: Downgradient Monitoring Wells							
JCW-MW-15007	587.40	Sand	582.7	to	579.2	3.98	583.42
JCW-MW-15009	589.64	Sand	581.9	to	576.9	8.40	581.24
JCW-MW-15010	597.76	Sand	579.7	to	578.2	16.64	581.12
JCW-MW-15028	589.64	Sand	567.7	to	564.7	7.73	581.91
Landfill: Downgradient Monitoring Wells (outside slurry wall)							
JCW-MW-18001	596.73	Sand and Sandy Clay	578.3	to	573.3	15.98	580.75
JCW-MW-18004	593.04	Sandy Clay	583.9	to	578.9	11.65	581.39
JCW-MW-18005	590.89	Sand and Sandy Clay	580.0	to	575.0	8.80	582.09
JCW-MW-18006	600.72	Fly Ash and Sandy Clay	582.8	to	577.8	14.76	585.96
MW-50	593.36	Sand	577.8	to	574.8	12.53	580.83
MW-51	594.29	Sand and Clay	577.8	to	574.8	13.30	580.99
MW-52	594.90	Sand	579.3	to	576.3	13.93	580.97
MW-53	593.68	Sand and Clay	579.1	to	576.1	12.90	580.78
MW-53R	594.25	Sand and Clay	580.4	to	575.4	13.40	580.85
MW-54R	593.89	Clay and Sand	581.3	to	576.3	13.00	580.89
MW-55	593.82	Sand	581.5	to	578.5	12.93	580.89
OW-57ROUT	591.00	Sandy Clay	577.0	to	572.0	10.18	580.82
Landfill: Static Water Level Only (inside slurry wall)							
JCW-OW-18001	595.84	Fly Ash and Sand	581.1	to	576.1	6.40	589.44
JCW-OW-18002	593.63	Sand	578.9	to	573.9	11.75	581.88
JCW-OW-18003	593.99	Sand and Clay	580.5	to	575.5	10.28	583.71
JCW-OW-18004	594.19	Sandy Clay	584.6	to	579.6	7.42	586.77
JCW-OW-18006	600.61	Fly Ash and Clay with Sand	582.9	to	577.9	11.42	589.19
MW-20	592.73	NR	~581.1	to	~578.1	7.03	585.70
OW-51	593.62	Clay and Sand	578.9	to	575.9	10.01	583.61
OW-53	593.64	Clay and Sand	579.0	to	576.0	8.62	585.02
OW-54	594.10	Clay and Sand	580.0	to	577.0	8.09	586.01
OW-55	594.67	Clay (or Sand and Clay)	580.9	to	577.9	6.80	587.87
OW-56R	592.01	Ash and Sand	577.5	to	572.5	17.15	574.86
OW-57R IN	590.86	Sandy Clay	575.7	to	570.7	7.41	583.45
OW-61	612.37	Ash and Sand	588.0	to	585.0	21.98	590.39
OW-63	612.53	Ash and Sand	594.2	to	591.2	26.80	585.73
Landfill: Leachate Headwells							
LH-103	603.49	Fly Ash	30.2	to	33.2	16.70	586.79
LH-104	596.56	Fly Ash	8.0	to	11.0	9.30	587.26

Notes:

Survey data from: Rowe Professional Services Company (Nov. 2015) and Consumers Energy Company drawings: SG-21733, Sheet 1, Rev. G (Karn, 11/27/18); and SG-21733, Sheet 2, Rev. C (Weadock, 11/27/18).

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.

Table 2
Summary of Field Parameters: May 2021
JC Weadock Bottom Ash Pond - Essexville - RCRA CCR Monitoring Program
Essexville, Michigan

Sample Location	Sample Date	Dissolved Oxygen (mg/L)	Oxidation Reduction Potential (mV)	pH (SU)	Specific Conductivity (umhos/cm)	Temperature (°C)	Turbidity (NTU)
Background							
MW-15002	5/3/2021	1.67	-53.1	6.5	6,236	10.4	4.4
MW-15008	5/3/2021	0.24	-225.3	6.8	967	9.0	5.4
MW-15016	5/3/2021	1.74	-10.4	7.2	991	10.2	3.1
MW-15019	5/3/2021	1.79	-69.2	6.8	1,398	8.6	3.4
Weadock Bottom Ash Pond							
JCW-MW-15007	5/12/2021	2.01	-38.3	7.1	13,475	9.0	3.10
JCW-MW-15009	5/12/2021	2.04	62.3	5.6	2,601	9.7	3.90
JCW-MW-15010	5/11/2021	1.81	-139.3	7.2	1,090	11.8	1.85
JCW-MW-15028	5/12/2021	2.18	-40.1	7.7	3,972	9.9	0.39

Notes:

mg/L - Milligrams per Liter.

mV - Millivolts.

SU - Standard Units.

umhos/cm - Micromhos per centimeter.

°C - Degrees Celsius.

NTU - Nephelometric Turbidity Unit.

Table 3
Summary of Groundwater Sampling Results (Analytical): May 2021
DE Karn & JC Weadock Background – RCRA CCR Monitoring Program
Essexville, Michigan

					Sample Location:	**MW-15002**	**MW-15008**	**MW-15016**	**MW-15019**
					Sample Date:	5/3/2021	5/3/2021	5/3/2021	5/3/2021
Constituent	Unit	EPA MCL	MI Residential*	MI Non-Residential*	MI GSI^	Background			
Appendix III[(1)]									
Boron	ug/L	NC	500	500	4,000	102	121	349	239
Calcium	mg/L	NC	NC	NC	500[EE]	364	105	219	155
Chloride	mg/L	**250****	**250**[E]	**250**[E]	**50**	**2,630**	**225**	**108**	**344**
Fluoride	ug/L	4,000	NC	NC	NC	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	**250****	**250**[E]	**250**[E]	500[EE]	31.3	< 1	**255**	52.4
Total Dissolved Solids	mg/L	**500****	**500**[E]	**500**[E]	**500**	**5,390**	**822**	**979**	**1,160**
pH, Field	SU	6.5 - 8.5**	6.5 - 8.5[E]	6.5 - 8.5[E]	6.5 - 9.0	6.5	6.8	7.2	6.8
Appendix IV[(1)]									
Antimony	ug/L	6	6	6	2	< 1	< 1	< 1	< 1
Arsenic	ug/L	10	10	10	10	1	< 1	4	1
Barium	ug/L	2,000	2,000	2,000	1,200	1,040	62	53	335
Beryllium	ug/L	4	4	4	33	< 1	< 1	< 1	< 1
Cadmium	ug/L	5	5	5	2.5	< 0.2	< 0.2	< 0.2	< 0.2
Chromium	ug/L	100	100	100	11	< 1	< 1	< 1	< 1
Cobalt	ug/L	NC	40	100	100	< 6	< 6	< 6	< 6
Fluoride	ug/L	4,000	NC	NC	NC	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	4	4	14	< 1	< 1	< 1	< 1
Lithium	ug/L	NC	170	350	440	19	15	79	12
Mercury	ug/L	2	2	2	0.20#	< 0.2	< 0.2	< 0.2	< 0.2
Molybdenum	ug/L	NC	73	210	120	< 5	< 5	< 5	< 5
Radium-226	pCi/L	NC	NC	NC	NC	1.24	< 0.298	< 0.218	< 0.309
Radium-228	pCi/L	NC	NC	NC	NC	2.49	< 0.699	0.606	< 0.707
Radium-226/228	pCi/L	5	NC	NC	NC	3.72	0.804	0.658	0.902
Selenium	ug/L	50	50	50	5	< 1	< 1	< 1	4
Thallium	ug/L	2	2	2	2	< 2	< 2	< 2	< 2
Additional MI Part 115[(2)]									
Iron	ug/L	**300****	**300**[E]	**300**[E]	500,000[EE]	**14,600**	**11,300**	**1,170**	**14,300**
Copper	ug/L	1,000**	1,000[E]	1,000[E]	20	1	1	1	< 1
Nickel	ug/L	NC	100	100	120	7	< 2	6	28
Silver	ug/L	100**	34	98	0.2	< 0.2	< 0.2	< 0.2	< 0.2
Vanadium	ug/L	NC	**4.5**	62	27	**12**	**8**	2	4
Zinc	ug/L	5,000**	2,400	5,000[E]	260	< 10	< 10	< 10	< 10

Notes:

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

SU - standard units; pH is a field parameter.

pCi/L - picocuries per liter.

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

NC - no criteria.

* - Michigan Part 201 Generic Drinking Water Cleanup Criteria, December 30, 2013.

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

^ - Michigan Part 201 Groundwater Surface Water Interface (GSI) Criteria. Hardness-dependent criteria calculated using hardness of 258 mg CaCO3/L (average of SW-01 [Lake Huron] and SW-02 [Saginaw River] collected in April 2018) per footnote {G} of Michigan Part 201 criteria tables. Chromium GSI criterion based on hexavalent chromium per footnote {H}. GSI criterion is protective for surface water used as a drinking water source as described in footnote {X}. GSI criterion for chloride is 50 mg/L when the discharge is to the Great Lakes or connecting waters per footnote {FF}

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

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

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

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

(2) Per Michigan Part 115 Amendments - Public Act No. 640 of 2018 Section 11511a(3)(c) and 11519b(2) additional detection monitoring constituents (iron) and assessment monitoring constituents (copper, nickel, silver, vanadium, and zinc) are reported.

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

RED value indicates an exceedance of the MCL.

All metals were analyzed as total unless otherwise specified.

Table 4
Summary of Groundwater Sampling Results (Analytical): May 2021
JC Weadock Bottom Ash Pond – RCRA CCR Monitoring Program
Essexville, Michigan

						Sample Location:	JCW-MW-15007	JCW-MW-15009	JCW-MW-15010	JCW-MW-15028
						Sample Date:	5/12/2021	5/12/2021	5/11/2021	5/12/2021
Constituent	Unit	EPA MCL	MI Residential*	MI Non-Residential*	MI GSI^					
Appendix III[(1)]										
Boron	ug/L	NC	**500**	**500**	4,000	233	255	**1,080**	**563**
Calcium	mg/L	NC	NC	NC	**500[EE]**	280	**574**	128	235
Chloride	mg/L	**250****	**250[E]**	**250[E]**	**50**	**3,780**	14.8	**67.8**	**921**
Fluoride	ug/L	4,000	4,000	4,000	NC	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	**250****	**250[E]**	**250[E]**	**500[EE]**	29	**1,450**	74.7	102
Total Dissolved Solids	mg/L	**500****	**500[E]**	**500[E]**	**500**	**7,200**	**2,230**	**607**	**2,130**
pH, Field	SU	**6.5 - 8.5****	**6.5 - 8.5[E]**	**6.5 - 8.5[E]**	**6.5 - 9.0**	7.1	**5.6**	7.2	7.7
Appendix IV[(1)]										
Antimony	ug/L	6	6	6	2	< 1	< 1	< 1	< 1
Arsenic	ug/L	**10**	**10**	**10**	**10**	**31**	< 1	6	3
Barium	ug/L	2,000	2,000	2,000	**1,200**	**1,680**	23	148	342
Beryllium	ug/L	4	4	4	33	< 1	< 1	< 1	< 1
Cadmium	ug/L	5	5	5	2.5	< 0.2	< 0.2	< 0.2	< 0.2
Chromium	ug/L	100	100	100	11	< 1	< 1	< 1	< 1
Cobalt	ug/L	NC	40	100	100	< 6	< 6	< 6	< 6
Fluoride	ug/L	4,000	4,000	4,000	NC	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	4	4	14	< 1	< 1	< 1	< 1
Lithium	ug/L	NC	170	350	440	70	89	70	51
Mercury	ug/L	2	2	2	0.20#	< 0.2	< 0.2	< 0.2	< 0.2
Molybdenum	ug/L	NC	73	210	120	8	< 5	< 5	< 5
Radium-226	pCi/L	NC	NC	NC	NC	1.32	0.333	< 0.410	0.621
Radium-228	pCi/L	NC	NC	NC	NC	1.27	0.720	0.700	0.997
Radium-226/228	pCi/L	NC	NC	NC	NC	2.59	1.05	0.898	1.62
Selenium	ug/L	50	50	50	5	4	< 1	< 1	< 1
Thallium	ug/L	2	2	2	2	< 2	< 2	< 2	< 2
Additional MI Part 115[(2)]										
Iron	ug/L	**300****	**300[E]**	**300[E]**	500,000[EE]	**3,230**	**28,300**	30	294
Copper	ug/L	1,000**	1,000[E]	1,000[E]	20	1	3	< 1	< 1
Nickel	ug/L	NC	100	100	120	7	9	2	4
Silver	ug/L	100**	34	98	0.2	< 0.2	< 0.2	< 0.2	< 0.2
Vanadium	ug/L	NC	**4.5**	62	27	**16**	3	< 2	**5**
Zinc	ug/L	5,000**	2,400	5,000	260	< 10	< 10	< 10	< 10

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 30, 2013.
** - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April, 2012.
^ - Michigan Part 201 Groundwater Surface Water Interface (GSI) Criteria. Hardness-dependent criteria calculated using hardness of 258 mg CaCO3/L (average of SW-01 [Lake Huron] and SW-02 [Saginaw River] collected in April 2018) per footnote {G} of Michigan Part 201 criteria tables. Chromium GSI criterion based on hexavalent chromium per footnote {H}. GSI criterion is protective for surface water used as a drinking water source as described in footnote {X}. GSI criterion for chloride is 50 mg/L when the discharge is to the Great Lakes or connecting waters per footnote {FF}.
# - If detected above 0.20 ug/L, further evaluation of low-level mercury may be necessary to evaluate the GSI pathway per Michigan Part 201 and MDEQ policy and procedure 09-014 dated June 20, 2012.
[E] - Criterion is the aesthetic drinking water value per footnote {E}.
[EE] - Criterion is based on the total dissolved solids GSI value per footnote {EE}.
(1) 40 CFR Part 257 Appendix III Detection Monitoring Constituents and Appendix IV Assessment Monitoring Constituents.
(2) Per Michigan Part 115 Amendments - Public Act No. 640 of 2018 Section 11511a(3)(c) and 11519b(2) additional detection monitoring constituents (iron) and assessment monitoring constituents (copper, nickel, silver, vanadium, and zinc) are reported.
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 – May 2021

JC Weadock Bottom Ash Pond – RCRA CCR Monitoring Program

Essexville, Michigan

Constituent	Units	GWPS	JCW-MW-15007		JCW-MW-15009	
			LCL	UCL	LCL	UCL
Arsenic	ug/L	21	13	48	--	--
Beryllium	ug/L	4	--	--	1.0	7.1
Barium	ug/L	2,000	940	2,400	--	--
Lithium	ug/L	180	--	--	47	210

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 " = 3,000 '
1:36,000

0 3,000 6,000 FEET

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

PROJECT:

CONSUMERS ENERGY COMPANY
DE KARN AND JC WEADOCK POWER PLANTS
ESSEXVILLE, MICHIGAN

TITLE:

SITE LOCATION MAP

DRAWN BY:	A. ADAIR
CHECKED BY:	J. KRENZ
APPROVED BY:	D. LITZ
DATE:	JULY 2021
PROJ. NO.:	418426.0000
FILE:	418426-102-004.mxd

FIGURE 1

S:\1-PROJECTS\Consumers_Energy_Company\Michigan\CCR_GW\2017_269767\3_WEADOCK\2021_MXDs\2021_002_MAY\418426-102-004.mxd -- Saved By: AADAIR on 7/29/2021, 11:56:38 AM

LEGEND

- BACKGROUND MONITORING WELL
- JCW BOTTOM ASH POND MONITORING WELL
- JCW LANDFILL HMP WELL
- LEACHATE HEADWELL
- MONITORING WELL (STATIC WATER LEVEL ONLY)
- DECOMMISSIONED MONITORING WELL
- SLURRY WALL (APPROXIMATE)

NOTES

1. BASE MAP IMAGERY FROM GOOGLE EARTH PRO, 2018.
2. MONITORING WELL AND SLURRY WALL LOCATIONS PROVIDED BY CEC; SG21733SHT2 REVB.DWG DATED 11/21/2018.
3. NOAA/NATIONAL OCEANIC SERVICE GREAT LAKES GAUGING STATION, ESSEXVILLE, MI (ID: 9075035).

0 600 1,200 Feet

1 " = 600 '

1:7,200

PROJECT:

CONSUMERS ENERGY COMPANY
JC WEADOCK POWER PLANT
ESSEXVILLE, MICHIGAN

TITLE:

SITE MAP

DRAWN BY:	A. ADAIR	PROJ NO.:	418426.0000
CHECKED BY:	J. KRENZ		
APPROVED BY:	D. LITZ		**FIGURE 2**
DATE:	JULY 2021		

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

FILE NO.: 418426-102-000.mxd

Coordinate System: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl (Foot)
Map Rotation: 0

Plot Date: 7/29/2021, 11:58:15 AM by AADAIR -- LAYOUT: ANSI B(11"x17")
Path: S:\11-PROJECTS\Consumers Energy Company\Michigan\CCR GW\2017 269767\3 WEADOCK\2021 MXDs\2021 002 MAY\418426-102-000.mxd

TRC - GIS

LAKE HURON
SAGINAW BAY
(580.77) NOTE 3

MW-50 (580.83)
MW-51 (580.99)
MW-52 (580.97)
JCW-OW-18002 (581.88)
OW-51 (583.61)
JCW-OW-18003 (583.71)
582.0
OW-64 (NM)
JCW-MW-15010 (581.12)
JCW-MW-18001 (580.75)
OW-63 (585.73)
JCW-OW-18001 (589.44)
OW-53 (585.02)
MW-53 (580.78)
JCW-MW-15009 (581.24)
OW-61 (590.39)
LH-103 (586.79)
JCW-MW-15028 (581.91)
JCW-MW-15007 (583.42)
MW-53R (580.85)
590.0
588.0
586.0
584.0
JCW-OW-18006 (589.19)
JCW-MW-18006 (585.96)
MW-54R (580.89)
OW-54 (586:01)
MW-54 (NM)
582.0
584.0
OW-57RIN (583.45)
OW-57ROUT (580.82)
586.0
MW-15008 (581.23)
OW-56R (584.86)
JCW-MW-18004 (581.39)
JCW-OW-18004 (586.77)
MW-20 (585.70)
OW-55 (587.87)
LH-104 (587.26)
JCW-MW-18005 (582.09)
MW-55 (580.89)
MW-15019 (581.32)
MW-15002 (581.15)
MW-15016 (582.11)

LEGEND

- BACKGROUND MONITORING WELL
- JCW BOTTOM ASH POND MONITORING WELL
- JCW LANDFILL HMP WELL
- LEACHATE HEADWELL
- MONITORING WELL (STATIC WATER LEVEL ONLY)
- DECOMMISSIONED MONITORING WELL
- SLURRY WALL (APPROXIMATE)
- GROUNDWATER ELEVATION CONTOUR (2' INTERVAL, DASHED WHERE INFERRED)
- (580.85) GROUNDWATER ELEVATION (FEET)
- (NU) NOT USED TO DEVELOP CONTOURS

NOTES

1. BASE MAP IMAGERY FROM GOOGLE EARTH PRO, 2018.
2. MONITORING WELL AND SLURRY WALL LOCATIONS PROVIDED BY CEC; SG21733SHT2 REVB.DWG DATED 11/21/2018.
3. NOAA/NATIONAL OCEANIC SERVICE GREAT LAKES GAUGING STATION, ESSEXVILLE, MI (ID: 9075035).
4. GROUNDWATER ELEVATIONS DISPLAYED IN FEET RELATIVE TO THE NORTH AMERICAN VERTICAL DATUM OF 1988.

N

0 600 1,200 Feet

1 " = 600 '
1:7,200

PROJECT:
CONSUMERS ENERGY COMPANY
JC WEADOCK POWER PLANT
ESSEXVILLE, MICHIGAN

TITLE:
POTENTIOMETRIC SURFACE MAP MAY 2021

DRAWN BY:	A. ADAIR	PROJ NO.:	418426.0000
CHECKED BY:	J. KRENZ		
APPROVED BY:	D. LITZ		**FIGURE 3**
DATE:	JULY 2021		

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

FILE NO.: 418426-102-003A.mxd

Plot Date: 7/29/2021, 14:43:19 PM by AADAIR -- LAYOUT: ANSI B (11"x17")
Path: S:\1-PROJECTS\Consumers Energy Company\Michigan\CCR GW\2017 26976\13 WEADOCK\2021 MXDs\2021 002 MAY\418426-102-003A.mxd
Coordinate System: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl (Foot)
Map Rotation: 0
TRC - GIS

Appendix A
Data Quality Reviews

Laboratory Data Quality Review
Groundwater Monitoring Event May 2021
JC Weadock/Karn DEK Background

Groundwater samples were collected by TRC for the May 2021 sampling event. Samples were analyzed for total metals, anions, total dissolved solids, and alkalinity by Consumers Energy (CE) Laboratory Services, located in Jackson, Michigan. The laboratory analytical results were reported in laboratory sample delivery group (SDG) 21-0525.

During the May 2021 sampling event, a groundwater sample was collected from each of the following wells:

- MW-15002
- MW-15008
- MW-15016
- MW-15019

Each sample was analyzed for the following constituents:

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

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

Data Usability Review Procedure

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

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

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

It should be noted that results for method blanks and laboratory control samples 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 metals, anions, TDS, and alkalinity 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 iron, copper, nickel, silver, vanadium, and zinc will be utilized for the purposes of an assessment monitoring program.
- Data are usable for the purposes of the assessment monitoring program.
- When the data are evaluated through an assessment monitoring statistical program, findings below may be used to support the removal of outliers.

QA/QC Sample Summary

- One field blank (FB-Background) was collected. Total metals and anions were not detected in this blank sample.
- An equipment blank was not collected with this data set.
- MS and MSD analyses were not performed on a sample from this data set.
- The field duplicate pair samples were DUP-Background/ MW-15002. All criteria were met.
- Laboratory duplicate analyses were not performed on a sample from this data set.

Laboratory Data Quality Review
Groundwater Monitoring Event May 2021
JC Weadock Bottom Ash Pond

Groundwater samples were collected by TRC for the May 2021 sampling event. Samples were analyzed for metals, anions, alkalinity, and total dissolved solids by Consumers Energy (CE) Laboratory Services in Jackson, Michigan. The laboratory analytical results were reported in laboratory sample delivery group (SDG) 21-0527.

During the May 2021 sampling event, a groundwater sample was collected from each of the following wells:

- JCW-MW-15007
- JCW-MW-15009
- JCW-MW-15010
- JCW-MW-15028

Each sample was analyzed for the following constituents:

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

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

Data Usability Review Procedure

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

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

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

It should be noted that results for method blanks and laboratory control samples 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 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, IV, optional Piper Diagram analyses, and additional Part 115 constituents will be utilized for the purposes of an assessment monitoring program.
- Data are usable for the purposes of the assessment monitoring program.
- When the data are evaluated through an assessment monitoring statistical program, findings below may be used to support the removal of outliers.

QA/QC Sample Summary:

- One equipment blank (EB-JCW-BAP) and one field blank (FB-JCW-BAP) were collected. Total metals were not detected in these blank samples.
- MS and MSD analyses were performed on sample JCW-MW-15009 for total metals, anions, and alkalinity. The recoveries were within the acceptance limits. 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-JCW-BAP and JCW-MW-15007; all criteria between the parent and duplicate sample were within the QC limits with the following exception:
  - The RPD for copper (66.7%) exceeded the acceptance limits. Potential uncertainty exists for all positive results for copper, as summarized in the attached table, Attachment 1.
- Laboratory duplicate analyses were not performed on a sample from this data set.

Attachment 1

Summary of Data Non-Conformances for Groundwater Analytical Data
JC Weadock Bottom Ash Pond – RCRA CCR Monitoring Program
Essexville, Michigan

Samples	Collection Date	Analyte	Non-Conformance/Issue
JCW-MW-15007	5/12/2021	Copper	Field duplicate analysis exceeds acceptance criteria (<60% RPD); indicates potential uncertainty in copper results.
JCW-MW-15009	5/12/2021		
DUP-JCW-BAP	5/12/2021		

Laboratory Data Quality Review
Groundwater Monitoring Event May 2021
JC Weadock/Karn DEK Background

Groundwater samples were collected by TRC for the May 2021 sampling event. Samples were analyzed for radium; the radium analyses were subcontracted by Eurofins-TestAmerica in Canton, Ohio to Eurofins-TestAmerica in St. Louis, Missouri. The laboratory analytical results were reported in laboratory sample delivery group (SDG) 240-149188-1.

During the May 2021 sampling event, a groundwater sample was collected from each of the following wells:

- MW-15002
- MW-15008
- MW-15016
- MW-15019

Each sample was analyzed for the following constituents:

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

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

Data Usability Review Procedure

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

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

- Percent recoveries for carriers. Carriers are used to assess the chemical yield for the preparation and/or instrument efficiency;
- Data for blind field duplicates. Field duplicate samples are used to assess variability introduced by the sampling and analytical processes; and
- Overall usability of the data.

This data usability report addresses the following items:

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

Review Summary

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

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

QA/QC Sample Summary

- A method blank was analyzed with each analytical batch for radium. Target analytes were not detected in the method blank samples.
- One field blank (FB-BACKGROUND) was collected. Target analytes were not detected in this blank sample.
- The LCS and LCSD recoveries and relative percent differences (RPDs) for radium were within QC limits.
- MS and MSD analyses were not performed on a sample from this data set.
- The field duplicate pair samples were DUP-BACKGROUND/MW-15002. All criteria were met.
- Laboratory duplicate analyses were not performed on a sample from this data set.
- Carrier recoveries were within 40-110%.

Laboratory Data Quality Review
Groundwater Monitoring Event May 2021
JC Weadock Bottom Ash Pond

Groundwater samples were collected by TRC for the May 2021 sampling event. Samples were analyzed for radium; the radium analyses were subcontracted by Eurofins-TestAmerica in Canton, Ohio to Eurofins-TestAmerica in St. Louis, Missouri. The laboratory analytical results were reported in laboratory sample delivery group (SDG) 240-149376-1.

During the May 2021 sampling event, a groundwater sample was collected from each of the following wells:

- JCW-MW-15007
- JCW-MW-15009
- JCW-MW-15010
- JCW-MW-15028

Each sample was analyzed for the following constituents:

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

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

Data Usability Review Procedure

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

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

- Percent recoveries for carriers. Carriers are used to assess the chemical yield for the preparation and/or instrument efficiency;
- Data for blind field duplicates. Field duplicate samples are used to assess variability introduced by the sampling and analytical processes; and
- Overall usability of the data.

This data usability report addresses the following items:

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

Review Summary

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

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

QA/QC Sample Summary

- A method blank was analyzed with each analytical batch for radium. Target analytes were not detected in the method blank samples.
- One equipment blank (EB-JCW BAP) was collected. Target analytes were not detected in this blank sample.
- The LCS and LCSD recoveries and relative percent differences (RPDs) for radium were within QC limits.
- MS and MSD analyses were not performed on a sample from this data set.
- The field duplicate pair samples were DUP-JCW BAP/JCW-MW-15007. All criteria were met.
- Laboratory duplicate analyses were not performed on a sample from this data set.
- Carrier recoveries were within 40-110%.

Appendix B
Statistical Evaluation of May 2021 Assessment Monitoring Sampling Event

1540 Eisenhower Pl.
Ann Arbor, MI 48108

T 734.971.7080
TRCcompanies.com

Technical Memorandum

Date:	July 27, 2021
To:	J.R. Register, Consumers Energy
From:	Darby Litz, TRC Katy Reminga, TRC
Project No.:	418426.0001 Phase 002, Task 002
Subject:	Statistical Evaluation of May 2021 Assessment Monitoring Sampling Event JC Weadock Bottom Ash Pond, Consumers Energy Company, Essexville, Michigan

During the statistical evaluation of the initial assessment monitoring event (May 2018), beryllium and lithium were present in one or more downgradient monitoring wells at statistically significant levels exceeding the Groundwater Protection Standards (GWPSs). Therefore, Consumers Energy Company (Consumers Energy) initiated an Assessment of Corrective Measures (ACM) within 90 days from when the Appendix IV exceedance was determined. The ACM was completed on September 11, 2019.

Currently, Consumers Energy is continuing semiannual assessment monitoring in accordance with §257.95 of the CCR Rule[1] at the JC Weadock Power Plant Bottom Ash Pond. The first semiannual assessment monitoring event for 2021 was conducted on May 10 through 12, 2021. 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 detailed in the October 15, 2018 Groundwater Protection Standards technical memorandum, which was also included in the 2018 Annual Groundwater Monitoring Report (TRC, January 2019). The following narrative describes the methods employed and the results obtained and the Sanitas™ output files are included as an attachment.

The statistical evaluation of the first semiannual 2021 assessment monitoring event data indicate no constituents are present at statistically significant levels that exceed the GWPSs in downgradient monitoring wells at the Weadock Bottom Ash Pond.

Constituent GWPS #Downgradient Wells Observed

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

All Appendix IV constituent concentrations have been below the GWPS for the past four semiannual sampling events, with the exception of arsenic at JCW-MW-15007, which has periodically exceeded the GWPS, but concentrations are not present at statistically significant levels (i.e., lower confidence limit is below the GWPS). Both beryllium and lithium at downgradient well JCW-MW-15009 were previously

[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 per Phase One, Part One of the CCR Rule (83 FR 36435).

present at statistically significant levels; however, the May 2021 statistical evaluation shows that the lower confidence limits for lithium and beryllium are currently below the GWPSs. Although no Appendix IV constituents are present at statistically significant levels above the GWPS based on this data evaluation, corrective action has been triggered as a result of data collected during the previous assessment monitoring events. Compliance with the GWPSs established under § 257.95(h) will be achieved by demonstrating that concentrations of constituents listed in Appendix IV to this part have not exceeded the GWPSs for a period of three consecutive years using the statistical procedures and performance standards in § 257.93(f) and (g). Consumers Energy will continue to evaluate corrective measures per §257.96 and §257.97. Consumers Energy will continue executing the self-implementing groundwater compliance schedule in conformance with §257.90 - §257.98.

Assessment Monitoring Statistical Evaluation

The four downgradient wells (JCW-MW-15007, JCW-MW-15009, JCW-MW-15010, and JCW-MW-15028) are located in accessible areas along the downgradient perimeter of the Weadock Bottom Ash Pond. Following the assessment monitoring sampling event, compliance well data for the Weadock Bottom Ash Pond 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. 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 true concentration, 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 no compelling evidence that the measured concentration is a result of a release from the CCR unit versus the inherent variability of the sample data. This statistical approach is consistent with the statistical methods for assessment monitoring presented in §257.93(f) and (g). Statistical evaluation methodologies built into the CCR Rule, and numerous other federal rules, are key in determining whether or not individually measured data points represent a concentration increase over the baseline or a fixed standard (such as a GWPS in an assessment monitoring program).

For each detected Appendix IV constituent, the concentrations from each well were first compared directly to the GWPS, as shown on Table 1. Parameter-well combinations that included a direct

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

exceedance of the GWPS within the past eight sampling events (April 2018 through May 2021) were retained for further analysis. Arsenic and barium at JCW-MW-15007, and beryllium and lithium at JCW-MW-15009 had individual results exceeding their respective GWPSs within this time period.

Groundwater data were evaluated utilizing Sanitas™ statistical software. Sanitas™ is a software tool that is commercially available for performing statistical evaluation consistent with procedures outlined in the Unified Guidance. Within the Sanitas™ statistical program, confidence limits were selected to perform the statistical comparison of compliance data to a fixed standard. Parametric and non-parametric confidence intervals, as appropriate, were calculated for each of the CCR Appendix IV constituents using a per test[3] 99 percent confidence level, i.e., a significance level (α) of 0.01. The following narrative describes the methods employed, the results obtained and the Sanitas™ output files are included as an attachment.

The statistical data evaluation included the following steps:

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

The results of these evaluations are presented and discussed below.

Data from each round were evaluated for completeness, overall quality, and usability and were deemed appropriate for the purposes of the CCR assessment monitoring program. Initially, the assessment monitoring results (April 2018 through May 2021) were observed visually for potential trends. No outliers were identified. Arsenic concentrations in JCW-MW-15010 and beryllium and lithium concentrations in JCW-MW-15009 appear to exhibit a downward trend and barium concentrations at JCW-MW-15028 appear to exhibit an increasing trend on the time series charts (Attachment 1). These data sets were tested further in Sanitas™ utilizing Sen's Slope to estimate the average rate of change in concentration over time and utilizing the Mann-Kendall trend test to test for significance of the trend at the 98% confidence level. The trend tests show that barium in in JCW-MW-15028 is generally increasing with time, as evidenced by the positive Sen's Slope, but that the upward trend is not statistically significant (Attachment 1). Arsenic concentrations in JCW-MW-15010 and beryllium and lithium concentrations in JCW-MW-15009 are generally decreasing with time, as evidenced by the negative Sen's Slope, but were also not statistically significant. The decreases in constituent concentrations at JCW-MW-15009 are causing the confidence intervals to widen. Calculating a confidence interval around a trending data set incorporates not only variability present naturally in the underlying dataset, but also incorporates variability due to the trend itself. Beryllium and lithium

[3] Confidence level is assessed for each individual comparison (i.e. per well and per constituent)

concentrations have already triggered assessment monitoring (e.g., not newly identified GWPS exceedances) and an interim measure has been initiated through cessation of hydraulic loading to the bottom ash pond in April 2018; therefore, traditional confidence interval calculations are presented in this statistical evaluation until more data are available. Once additional data are collected in the absence of hydraulic loading, confidence bands may be a more appropriate assessment to determine compliance with the CCR Rule. Confidence bands are selected by the UG as the appropriate method for calculating confidence intervals on trending data. A confidence band calculates upper and lower confidence limits at each point along the trend to reduce variability and create a narrower confidence interval. At least 8 to 10 measurements should be available when computing a confidence band around a linear regression.

The Sanitas™ software was then used to test compliance at the downgradient monitoring wells using the confidence interval method for the most recent 8 sampling events. Eight independent sampling events provide the appropriate density of data as recommended per the Unified Guidance yet are collected recently enough to provide an indication of current condition. The tests were run with a per-test significance of $\alpha = 0.01$. The software outputs are included in Attachment 1 along with data reports showing the values used for the evaluation. The percentage of non-detect observations are also included in Attachment 1. Non-detect data was handled in accordance with the Stats Plan for the purposes of calculating the confidence intervals.

The Sanitas™ software generates an output that includes graphs of the parametric or non-parametric confidence intervals for each well along with notes data transformations, as appropriate. The data sets for arsenic at JCW-MW-15007 and lithium at JCW-MW-15009 were found to be normally distributed. Non-parametric confidence intervals were used for barium at JCW-MW-15007 and beryllium at JCW-MW-15009 due to non-normal datasets. The confidence interval test compares the lower confidence limit to the GWPS. The statistical evaluation of the Appendix IV parameters shows no constituents present at statistically significant levels that exceed the GWPSs. The results of the assessment monitoring statistical evaluation are consistent with the previous (October 2020) assessment monitoring data statistical evaluation. Although no Appendix IV constituents are present at statistically significant levels above the GWPS based on this data evaluation. Compliance with the GWPSs established under § 257.95(h) will be achieved by demonstrating that concentrations of constituents listed in Appendix IV to this part have not exceeded the GWPSs for a period of three consecutive years using the statistical procedures and performance standards in § 257.93(f) and (g). Consumers Energy will continue to evaluate corrective measures per §257.96 and §257.97. 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 – December 2015 to May 2021

Attachment 1 Sanitas™ Output Files

Table

Table 1
Comparison of Groundwater Sampling Results to Groundwater Protection Standards – April 2018 to May 2021
JC Weadock Bottom Ash Pond – RCRA CCR Monitoring Program
Essexville, Michigan

						Sample Location:	JCW-MW-15007								
						Sample Date:	4/10/2018	5/23/2018	11/7/2018	4/9/2019	10/15/2019	10/15/2019	5/14/2020	10/13/2020	5/12/2021	5/12/2021
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS											
Appendix III												Field Dup				Field Dup
Boron	ug/L	NC	NA	619	NA		--	308	656	290	470	460	335	329	233	240
Calcium	mg/L	NC	NA	302	NA		--	145	153	200	130	120	217	413	280	294
Chloride	mg/L	250*	NA	2,440	NA		--	1,660	788	1,600	1,200	1,200	2,870	5,810	3,780	3,830
Fluoride	ug/L	4,000	NA	1,000	NA		< 1,000	< 1,000	< 1,000	< 10,000 (1)	< 5,000(1)	< 5,000(1)	< 1,000	1,160	< 1,000	< 1,000
Sulfate	mg/L	250*	NA	407	NA		--	19.6	23.9	< 20	44	43	57.2	4.47	29.0	29.8
Total Dissolved Solids	mg/L	500*	NA	4,600	NA		--	3,210	1,790	3,400	2,300	2,400	5,080	11,200	7,200	7,280
pH, Field	SU	6.5 - 8.5*	NA	6.5-7.3	NA		7.1	7.2	7.1	7.2	7.1	--	7.6	7.3	7.1	--
Appendix IV																
Antimony	ug/L	6	NA	1	6		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1	< 1
Arsenic	ug/L	10	NA	21	**21**		16.7	**25.6**	**46.3**	9.8	**34**	**35**	19	**61**	**31**	**31**
Barium	ug/L	2,000	NA	1,300	**2,000**		957	941	1,060	950	970	970	1,180	**2,400**	1,680	1,670
Beryllium	ug/L	4	NA	1	**4**		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1	< 1
Cadmium	ug/L	5	NA	0.2	5		< 0.20	< 0.20	< 1.0	< 0.20	< 0.20	< 0.20	< 0.2	< 0.2	< 0.2	< 0.2
Chromium	ug/L	100	NA	3	100		< 1.0	< 1.0	< 5.0	< 1.0	< 1.0	< 1.0	< 1	1	< 1	< 1
Cobalt	ug/L	NC	6	15	15		< 15.0	< 15.0	< 30.0 (1)	< 6.0	< 6.0	< 6.0	< 6	< 6	< 6	< 6
Fluoride	ug/L	4,000	NA	1,000	4,000		< 1,000	< 1,000	< 1,000	< 10,000 (1)	< 5,000(1)	< 5,000(1)	< 1,000	1,160	< 1,000	< 1,000
Lead	ug/L	NC	15	1	15		< 1.0	< 1.0	< 5.0	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1	< 1
Lithium	ug/L	NC	40	180	**180**		80	88	87	67	70	67	103	94	70	69
Mercury	ug/L	2	NA	0.2	2		< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.2	< 0.2	< 0.2	< 0.2
Molybdenum	ug/L	NC	100	6	100		6.4	7.6	< 25.0	6.2	9.7	9.6	< 5	< 5	8	8
Radium-226	pCi/L	NC	NA	NA	NA		0.878	0.239	1.33	0.628	0.659	0.442	0.728	1.71	1.32	1.01
Radium-228	pCi/L	NC	NA	NA	NA		0.761	0.795	0.975	0.492	0.796	0.543	0.698	1.67	1.27	1.43
Radium-226/228	pCi/L	5	NA	3.32	5		1.64	1.03	2.31	1.12	1.45	0.986	1.43	3.38	2.59	2.45
Selenium	ug/L	50	NA	2	50		1.2	< 1.0	< 1.0	3.2	< 1.0	< 1.0	< 1	< 1	4	3
Thallium	ug/L	2	NA	2	2		< 2.0	< 2.0	< 10.0 (1)	< 2.0	< 2.0	< 2.0	< 2	< 2	< 2	< 2

Notes:
ug/L - micrograms per liter.
mg/L - milligrams per liter.
SU - standard units; pH is a field parameter.
pCi/L - picocuries per liter.
NA - not applicable.
NC - no criteria.
-- - not analyzed.
MCL - Maximum Contaminant Level, EPA Drinking Water Standards and Health Advisories, April 2012.
RSL - Regional Screening Level from 83 FR 36435.
UTL - Upper Tolerance Limit (95%) of the background data set.
GWPS - Groundwater Protection Standard. GWPS is the higher of the MCL/RSL and UTL as established in TRC's Technical Memorandum dated October 15, 2018.
* - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April 2012.
Bold value indicates an exceedance of the GWPS. Data from downgradient monitoring wells are screened against the GWPS for evaluation purposes only. Confidence intervals will be used to determine compliance per the CCR rules.
All metals were analyzed as total unless otherwise specified.
(1) Laboratory reporting limit exceeds GWPS due to sample dilutions performed as a result of sample matrix interferences. and/or concentrations of other constituents present.

Table 1
Comparison of Groundwater Sampling Results to Groundwater Protection Standards – April 2018 to May 2021
JC Weadock Bottom Ash Pond – RCRA CCR Monitoring Program
Essexville, Michigan

						Sample Location:	JCW-MW-15009						
						Sample Date:	4/10/2018	5/23/2018	11/7/2018	4/9/2019	10/15/2019	5/14/2020	10/13/2020	5/12/2021
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS									
Appendix III														
Boron	ug/L	NC	NA	619	NA		--	297	422	290	330	141	263	255
Calcium	mg/L	NC	NA	302	NA		--	530	589	510	520	314	560	574
Chloride	mg/L	250*	NA	2,440	NA		--	41	64.9	43	18	3.19	5.96	14.8
Fluoride	ug/L	4,000	NA	1,000	NA		< 1,000	< 1,000	< 1,000	< 2,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	250*	NA	407	NA		--	1,690	1,980	1,600	1,400	611	1,060	1,450
Total Dissolved Solids	mg/L	500*	NA	4,600	NA		--	2,510	2,620	2,400	2,100	1,370	1,910	2,230
pH, Field	SU	6.5 - 8.5*	NA	6.5-7.3	NA		4.7	4.9	4.8	5.4	6.1	7.2	6.6	5.6
Appendix IV														
Antimony	ug/L	6	NA	1	6		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1
Arsenic	ug/L	10	NA	21	**21**		1.6	1.4	< 5.0	< 1.0	< 1.0	< 1	1	< 1
Barium	ug/L	2,000	NA	1,300	**2,000**		12.3	14.4	14.8	14	66	58	51	23
Beryllium	ug/L	4	NA	1	**4**		**7.1**	**6.5**	**6.6**	**4.3**	< 1.0	< 1	< 1	< 1
Cadmium	ug/L	5	NA	0.2	5		< 0.20	< 0.20	< 1.0	0.24	< 0.20	< 0.2	< 0.2	< 0.2
Chromium	ug/L	100	NA	3	100		1.4	1.4	< 5.0	1.4	< 1.0	2	< 1	< 1
Cobalt	ug/L	NC	6	15	15		< 15.0	< 15.0	< 30.0 (1)	< 6.0	< 6.0	< 6	< 6	< 6
Fluoride	ug/L	4,000	NA	1,000	4,000		< 1,000	< 1,000	< 1,000	< 2,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	15	1	15		< 1.0	< 1.0	< 5.0	< 1.0	< 1.0	< 1	< 1	< 1
Lithium	ug/L	NC	40	180	**180**		**210**	**190**	**240**	150	94	18	53	89
Mercury	ug/L	2	NA	0.2	2		< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.2	< 0.2	< 0.2
Molybdenum	ug/L	NC	100	6	100		< 5.0	< 5.0	< 25.0	< 5.0	9.3	10	9	< 5
Radium-226	pCi/L	NC	NA	NA	NA		< 0.703	< 0.723	< 0.803	< 0.0879	0.175	< 0.125	< 0.352	0.333
Radium-228	pCi/L	NC	NA	NA	NA		0.707	1.11	1.25	< 0.411	0.548	< 0.491	< 0.495	0.720
Radium-226/228	pCi/L	5	NA	3.32	5		< 1.37	< 1.37	< 1.54	< 0.411	0.723	< 0.491	< 0.495	1.05
Selenium	ug/L	50	NA	2	50		14.2	5.2	< 5.0	2.0	2.0	1	< 1	< 1
Thallium	ug/L	2	NA	2	2		< 2.0	< 2.0	< 10.0 (1)	< 2.0	< 2.0	< 2	< 2	< 2

Notes:
ug/L - micrograms per liter.
mg/L - milligrams per liter.
SU - standard units; pH is a field parameter.
pCi/L - picocuries per liter.
NA - not applicable.
NC - no criteria.
-- - not analyzed.
MCL - Maximum Contaminant Level, EPA Drinking Water Standards and Health Advisories, April 2012.
RSL - Regional Screening Level from 83 FR 36435.
UTL - Upper Tolerance Limit (95%) of the background data set.
GWPS - Groundwater Protection Standard. GWPS is the higher of the MCL/RSL and UTL as established in TRC's Technical Memorandum dated October 15, 2018.
* - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April 2012.
Bold value indicates an exceedance of the GWPS. Data from downgradient monitoring wells are screened against the GWPS for evaluation purposes only. Confidence intervals will be used to determine compliance per the CCR rules.
All metals were analyzed as total unless otherwise specified.
(1) Laboratory reporting limit exceeds GWPS due to sample dilutions performed as a result of sample matrix interferences. and/or concentrations of other constituents present.

Table 1
Comparison of Groundwater Sampling Results to Groundwater Protection Standards – April 2018 to May 2021
JC Weadock Bottom Ash Pond – RCRA CCR Monitoring Program
Essexville, Michigan

						Sample Location:	JCW-MW-15010								
						Sample Date:	4/10/2018	5/22/2018	5/22/2018	11/7/2018	4/9/2019	10/14/2019	5/14/2020	10/13/2020	10/13/2020	5/11/2021
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS				Field Dup						Field Dup	
Appendix III																
Boron	ug/L	NC	NA	619	NA		--	1,330	1,220	1,360	1,400	1,400	2,070	2,000	2,030	1,080
Calcium	mg/L	NC	NA	302	NA		--	78.3	78.8	84.4	120	110	286	218	204	128
Chloride	mg/L	250*	NA	2,440	NA		--	99.8	99.7	96.5	140	140	90.4	105	106	67.8
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	407	NA		--	24.3	23.2	22.3	36	30	553	254	255	74.7
Total Dissolved Solids	mg/L	500*	NA	4,600	NA		--	458	486	492	670	600	1,500	982	997	607
pH, Field	SU	6.5 - 8.5*	NA	6.5-7.3	NA		7.3	7.5	--	7.4	7.6	7.3	7.7	7.1	--	7.2
Appendix IV																
Antimony	ug/L	6	NA	1	6		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1	< 1
Arsenic	ug/L	10	NA	21	**21**		12.5	11.4	11.1	9.5	16	13	4	4	4	6
Barium	ug/L	2,000	NA	1,300	**2,000**		121	123	116	114	190	180	400	220	221	148
Beryllium	ug/L	4	NA	1	**4**		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1	< 1
Cadmium	ug/L	5	NA	0.2	5		< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.2	< 0.2	< 0.2	< 0.2
Chromium	ug/L	100	NA	3	100		< 1.0	< 1.0	< 1.0	1.2	< 1.0	< 1.0	< 1	< 1	< 1	< 1
Cobalt	ug/L	NC	6	15	15		< 15.0	< 15.0	< 15.0	< 6.0	< 6.0	< 6.0	< 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	< 1,000
Lead	ug/L	NC	15	1	15		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1	< 1
Lithium	ug/L	NC	40	180	**180**		77	72	72	70	73	84	116	96	97	70
Mercury	ug/L	2	NA	0.2	2		< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.2	< 0.2	< 0.2	< 0.2
Molybdenum	ug/L	NC	100	6	100		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5	< 5	< 5	< 5
Radium-226	pCi/L	NC	NA	NA	NA		< 0.831	< 0.618	< 0.668	< 0.879	0.215	< 0.134	0.409	< 0.442	< 0.445	< 0.410
Radium-228	pCi/L	NC	NA	NA	NA		1.39	< 0.741	< 0.701	< 0.776	0.424	0.412	< 0.467	< 0.493	< 0.566	0.700
Radium-226/228	pCi/L	5	NA	3.32	5		< 2.04	< 1.36	< 1.37	< 1.66	0.639	0.536	0.781	< 0.493	< 0.566	0.898
Selenium	ug/L	50	NA	2	50		< 1.0	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1	< 1
Thallium	ug/L	2	NA	2	2		< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2	< 2	< 2	< 2

Notes:
ug/L - micrograms per liter.
mg/L - milligrams per liter.
SU - standard units; pH is a field parameter.
pCi/L - picocuries per liter.
NA - not applicable.
NC - no criteria.
-- - not analyzed.
MCL - Maximum Contaminant Level, EPA Drinking Water Standards and Health Advisories, April 2012.
RSL - Regional Screening Level from 83 FR 36435.
UTL - Upper Tolerance Limit (95%) of the background data set.
GWPS - Groundwater Protection Standard. GWPS is the higher of the MCL/RSL and UTL as established in TRC's Technical Memorandum dated October 15, 2018.
* - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April 2012.
Bold value indicates an exceedance of the GWPS. Data from downgradient monitoring wells are screened against the GWPS for evaluation purposes only. Confidence intervals will be used to determine compliance per the CCR rules.
All metals were analyzed as total unless otherwise specified.
(1) Laboratory reporting limit exceeds GWPS due to sample dilutions performed as a result of sample matrix interferences. and/or concentrations of other constituents present.

Table 1
Comparison of Groundwater Sampling Results to Groundwater Protection Standards – April 2018 to May 2021
JC Weadock Bottom Ash Pond – RCRA CCR Monitoring Program
Essexville, Michigan

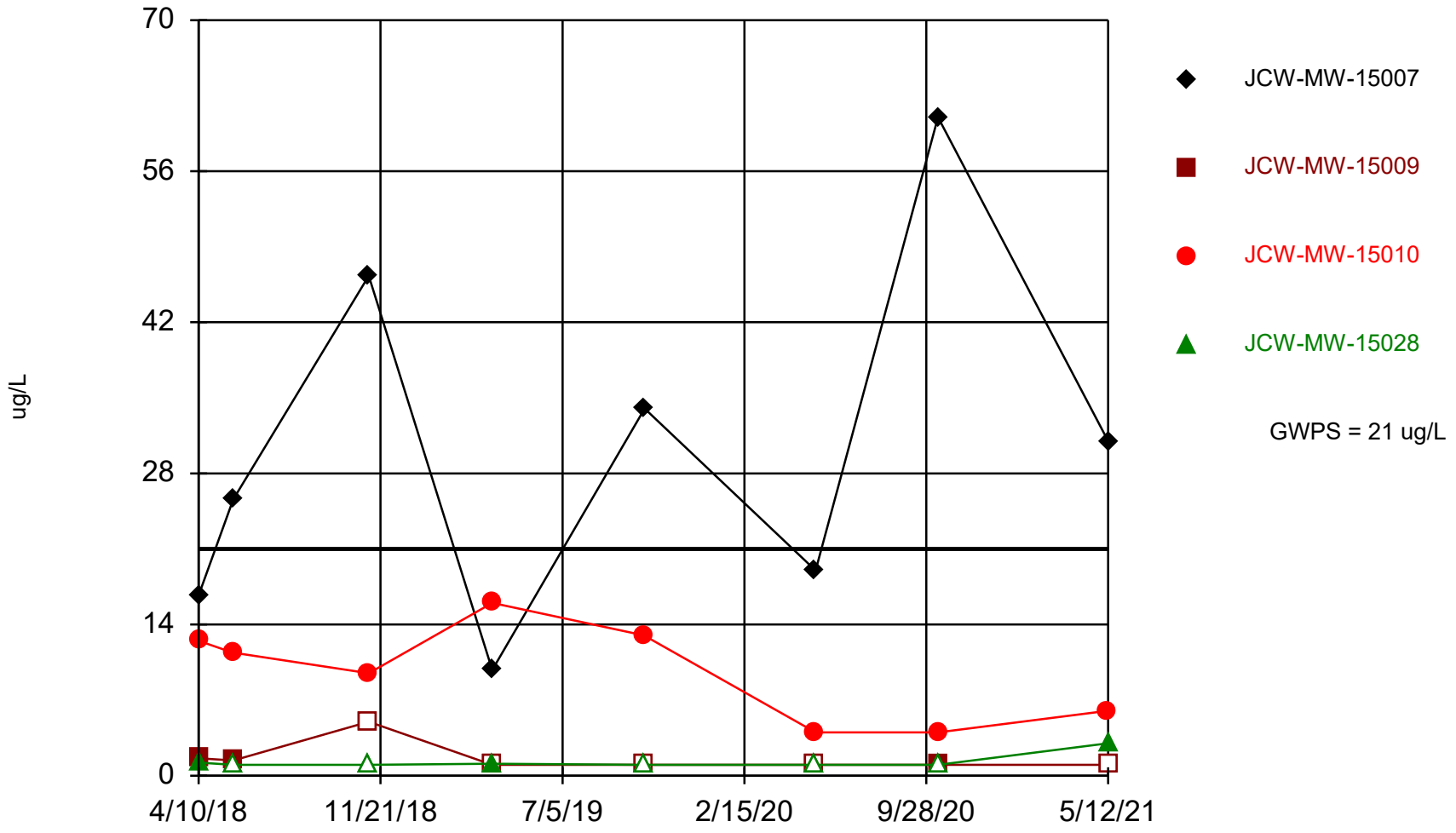
						Sample Location:	JCW-MW-15028											
						Sample Date:	4/11/2018	4/11/2018	5/23/2018	11/7/2018	11/7/2018	4/9/2019	4/9/2019	10/14/2019	5/14/2020	5/14/2020	10/13/2020	5/12/2021
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS			Field Dup			Field Dup		Field Dup			Field Dup		
Appendix III																		
Boron	ug/L	NC	NA	619	NA		--	--	444	517	525	530	560	550	570	562	644	563
Calcium	mg/L	NC	NA	302	NA		--	--	125	153	153	170	180	170	205	204	221	235
Chloride	mg/L	250*	NA	2,440	NA		--	--	69.5	352	347	660	650	640	823	806	811	921
Fluoride	ug/L	4,000	NA	1,000	NA		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 2,000	< 2,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	250*	NA	407	NA		--	--	32.2	111	110	120	120	120	128	122	99.8	102
Total Dissolved Solids	mg/L	500*	NA	4,600	NA		--	--	1,030	976	966	1,800	1,800	1,500	2,210	2,240	2,070	2,130
pH, Field	SU	6.5 - 8.5*	NA	6.5-7.3	NA		7.8	--	8.0	7.9	--	8.0	--	7.8	8.1	--	7.9	7.7
Appendix IV																		
Antimony	ug/L	6	NA	1	6		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1	< 1
Arsenic	ug/L	10	NA	21	**21**		1.2	1.4	< 1.0	< 1.0	1.1	1.1	1.1	< 1.0	< 1	1	< 1	3
Barium	ug/L	2,000	NA	1,300	**2,000**		148	145	148	156	158	250	240	230	324	331	332	342
Beryllium	ug/L	4	NA	1	**4**		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1	< 1
Cadmium	ug/L	5	NA	0.2	5		< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.2	< 0.2	< 0.2	< 0.2
Chromium	ug/L	100	NA	3	100		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1	< 1
Cobalt	ug/L	NC	6	15	15		< 15.0	< 15.0	< 15.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6	< 6	< 6	< 6
Fluoride	ug/L	4,000	NA	1,000	4,000		< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 2,000	< 2,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	15	1	15		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	2	< 1
Lithium	ug/L	NC	40	180	**180**		48	47	48	51	49	53	51	48	60	60	53	51
Mercury	ug/L	2	NA	0.2	2		< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.2	< 0.2	< 0.2	< 0.2
Molybdenum	ug/L	NC	100	6	100		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5	< 5	< 5	< 5
Radium-226	pCi/L	NC	NA	NA	NA		< 0.934	< 0.450	< 0.739	1.13	0.786	0.621	0.384	0.576	0.515	< 0.136	0.697	0.621
Radium-228	pCi/L	NC	NA	NA	NA		0.988	0.874	< 0.676	< 0.685	<0.591	0.729	0.658	0.585	0.733	< 0.399	< 0.468	0.997
Radium-226/228	pCi/L	5	NA	3.32	5		1.65	1.30	< 1.42	1.60	1.26	1.35	1.04	1.16	1.25	< 0.399	1.15	1.62
Selenium	ug/L	50	NA	2	50		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1	< 1
Thallium	ug/L	2	NA	2	2		< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2	< 2	< 2	< 2

Notes:
ug/L - micrograms per liter.
mg/L - milligrams per liter.
SU - standard units; pH is a field parameter.
pCi/L - picocuries per liter.
NA - not applicable.
NC - no criteria.
-- - not analyzed.
MCL - Maximum Contaminant Level, EPA Drinking Water Standards and Health Advisories, April 2012.
RSL - Regional Screening Level from 83 FR 36435.
UTL - Upper Tolerance Limit (95%) of the background data set.
GWPS - Groundwater Protection Standard. GWPS is the higher of the MCL/RSL and UTL as established in TRC's Technical Memorandum dated October 15, 2018.
* - Secondary Maximum Contaminant Level (SMCL), EPA Secondary Drinking Water Regulations (SDWR) April 2012.
Bold value indicates an exceedance of the GWPS. Data from downgradient monitoring wells are screened against the GWPS for evaluation purposes only. Confidence intervals will be used to determine compliance per the CCR rules.
All metals were analyzed as total unless otherwise specified.
(1) Laboratory reporting limit exceeds GWPS due to sample dilutions performed as a result of sample matrix interferences. and/or concentrations of other constituents present.

Attachment 1
Sanitas™ Output Files

Hollow symbols indicate censored values.

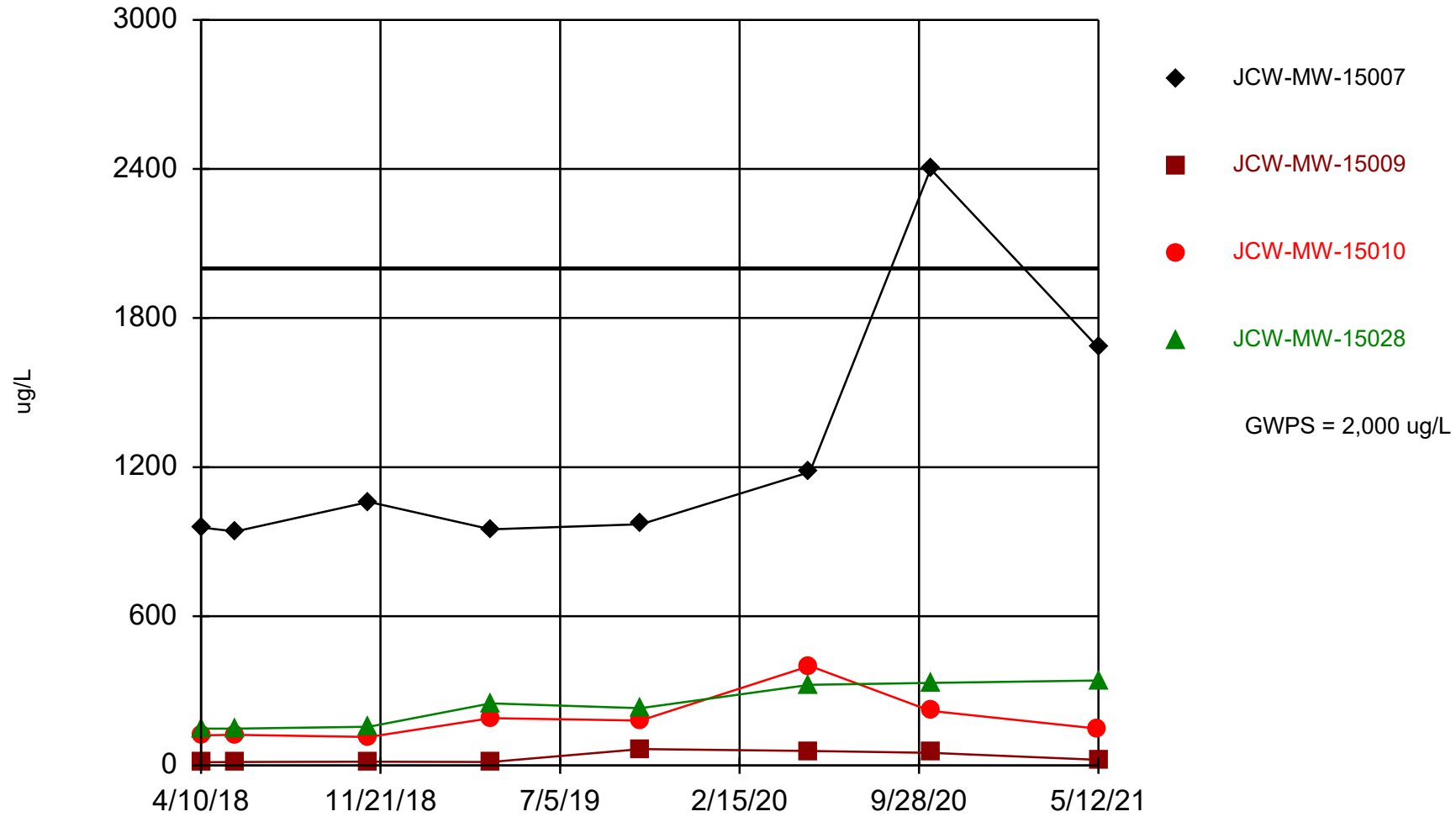
Arsenic Comparison to GWPS



Time Series Analysis Run 6/18/2021 9:35 AM

Client: Consumers Energy Data: JCW_HMPCCR_Sanitas_21Q2

Barium Comparison to GWPS

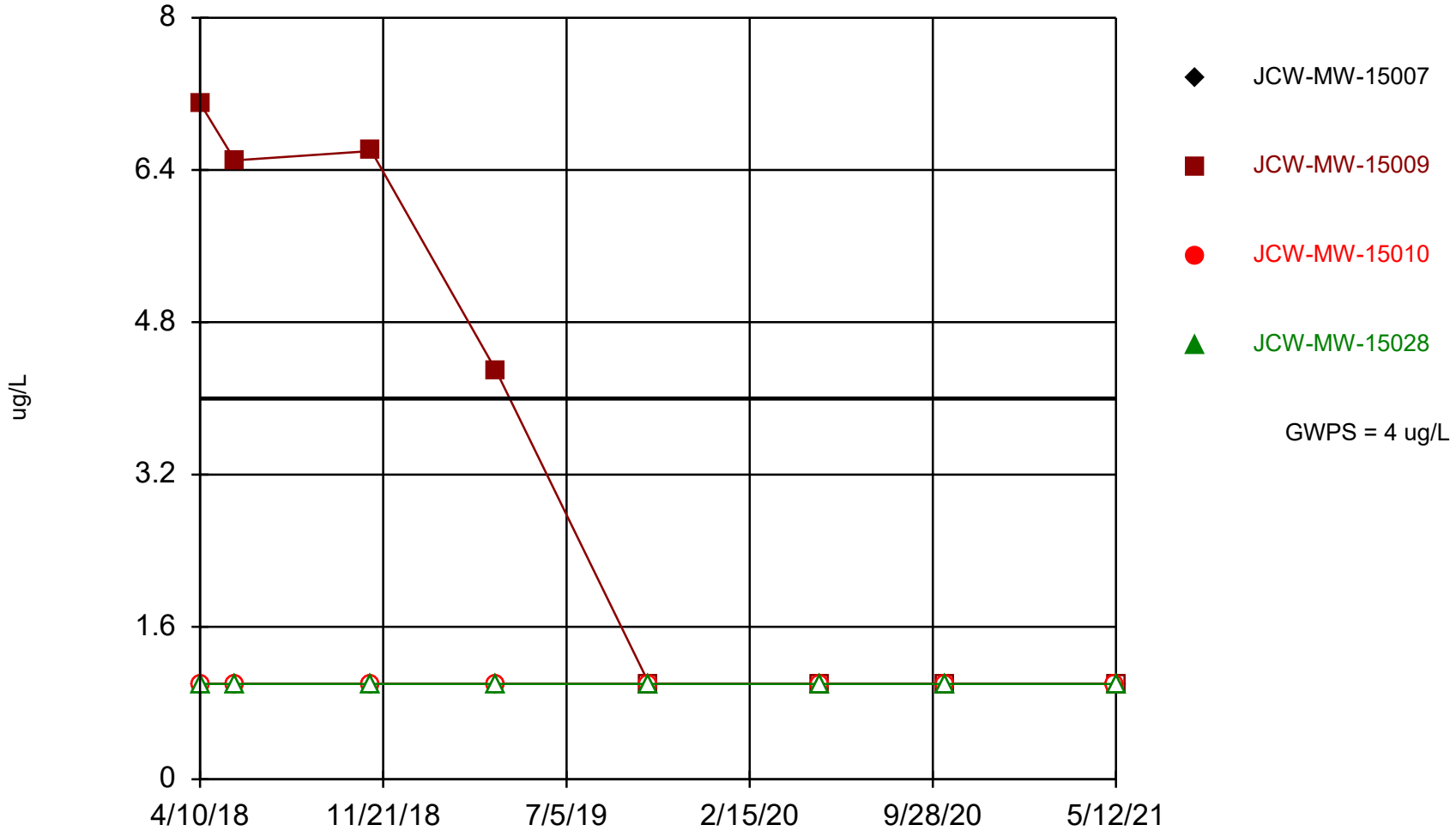


Time Series Analysis Run 6/18/2021 9:37 AM

Client: Consumers Energy Data: JCW_HMPCCR_Sanitas_21Q2

Hollow symbols indicate censored values.

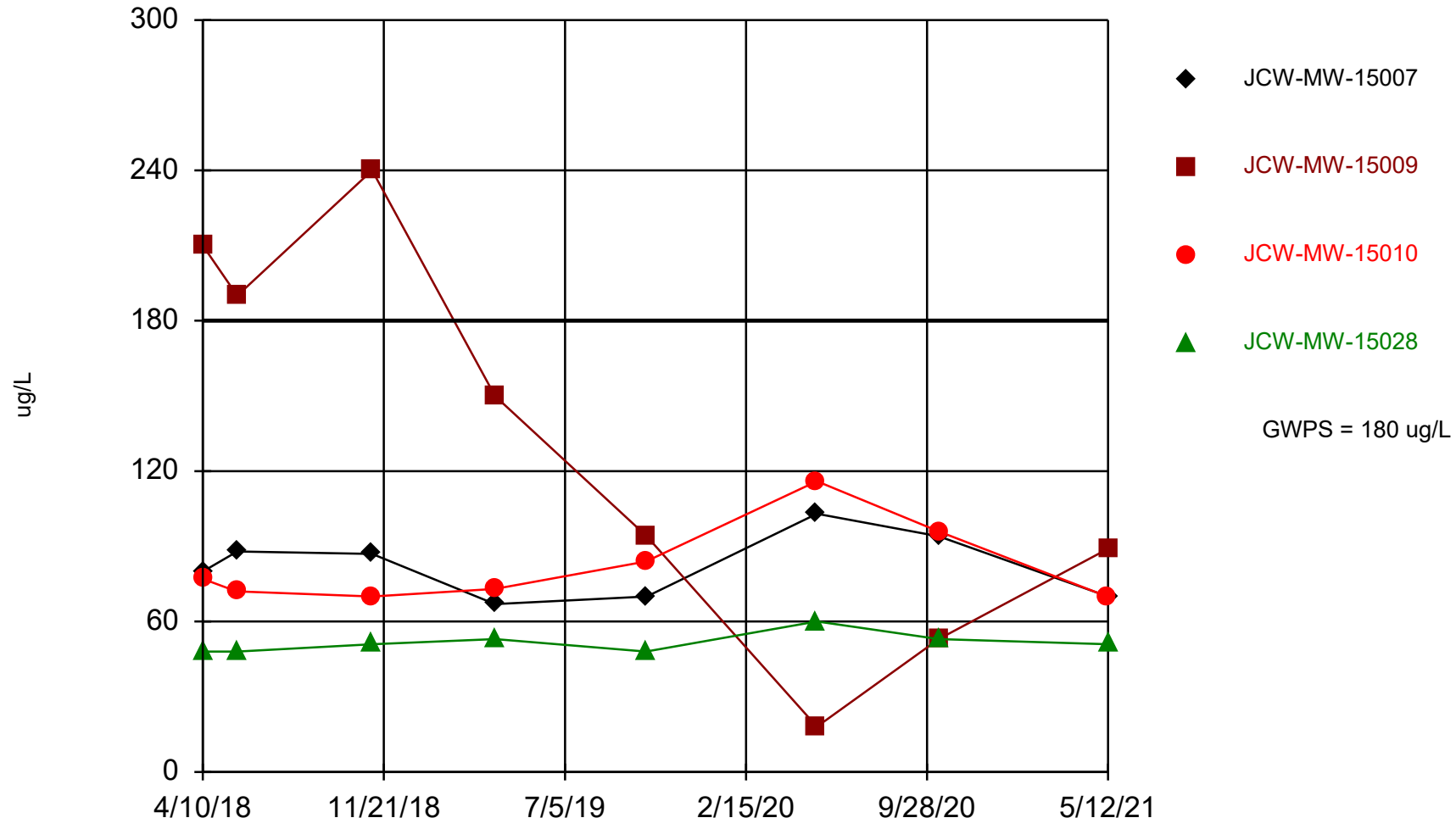
Beryllium Comparison to GWPS



Time Series Analysis Run 6/18/2021 9:37 AM

Client: Consumers Energy Data: JCW_HMPCCR_Sanitas_21Q2

Lithium Comparison to GWPS

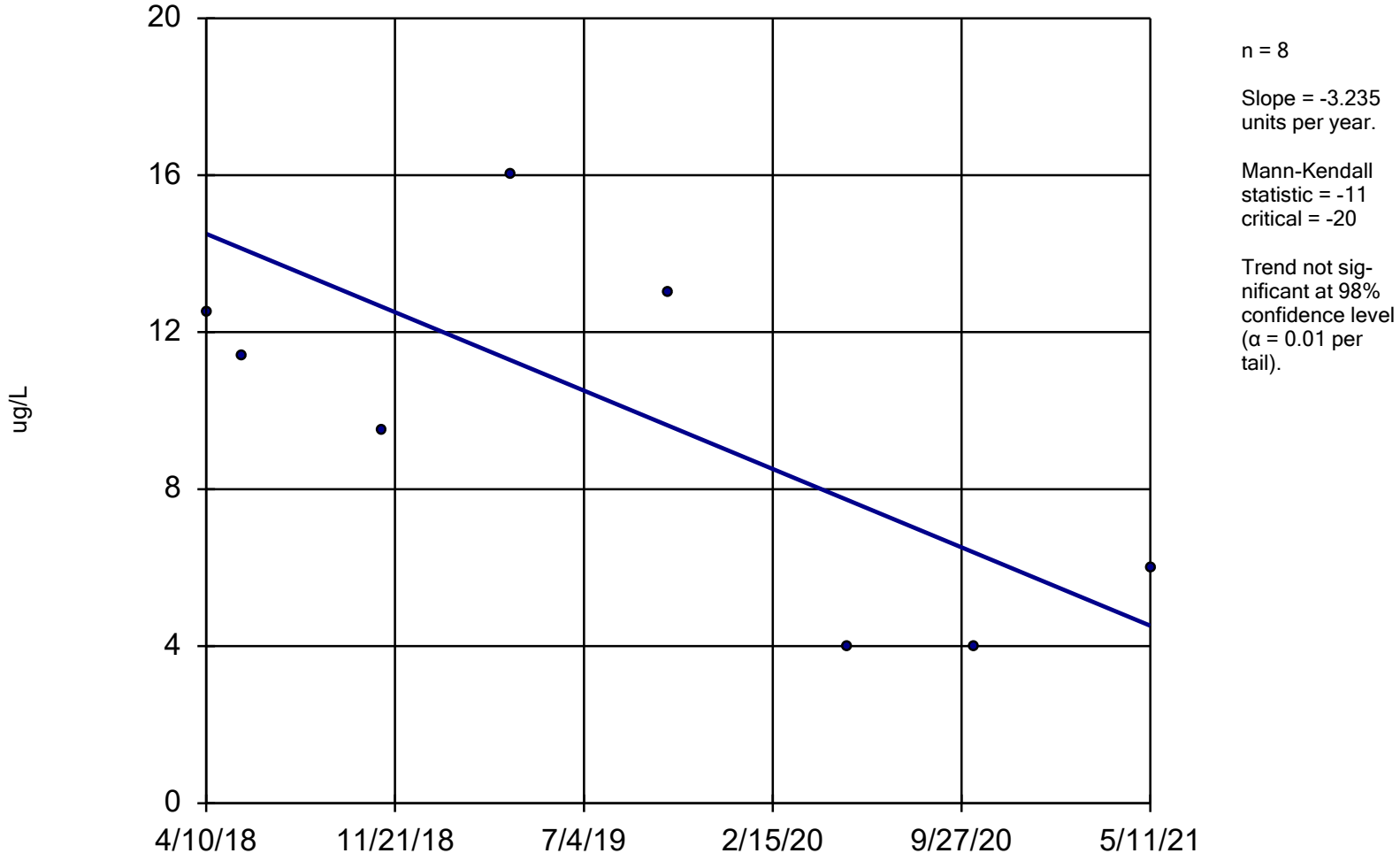


Time Series Analysis Run 6/18/2021 9:38 AM

Client: Consumers Energy Data: JCW_HMPCCR_Sanitas_21Q2

Arsenic, Total

JCW-MW-15010



n = 8

Slope = -3.235 units per year.

Mann-Kendall statistic = -11 critical = -20

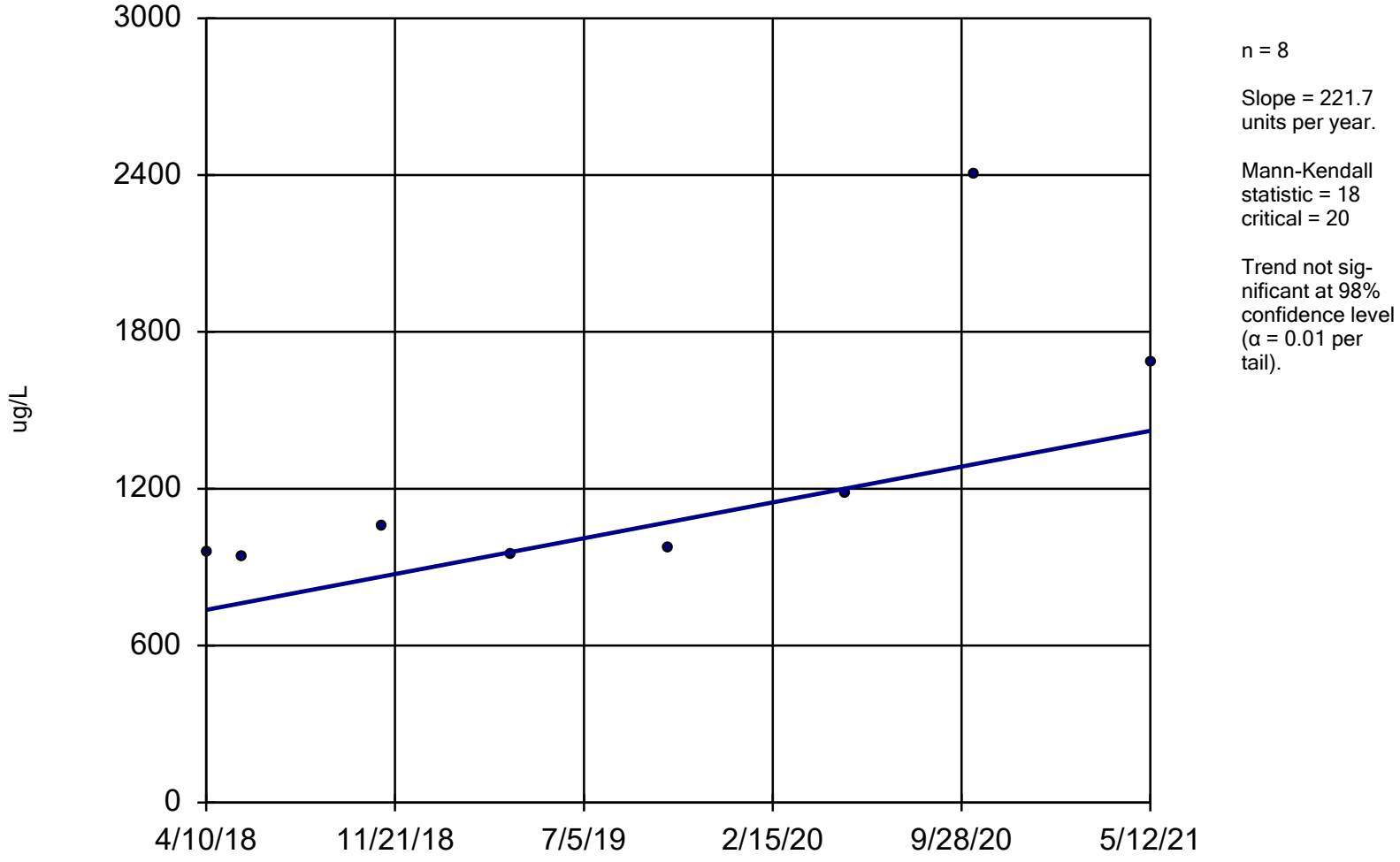
Trend not significant at 98% confidence level (α = 0.01 per tail).

Sen's Slope Estimator Analysis Run 7/2/2021 3:48 PM

Client: Consumers Energy Data: JCW_HMPCCR_Sanitas_21Q2_backup

Barium, Total

JCW-MW-15007



n = 8

Slope = 221.7 units per year.

Mann-Kendall statistic = 18
critical = 20

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

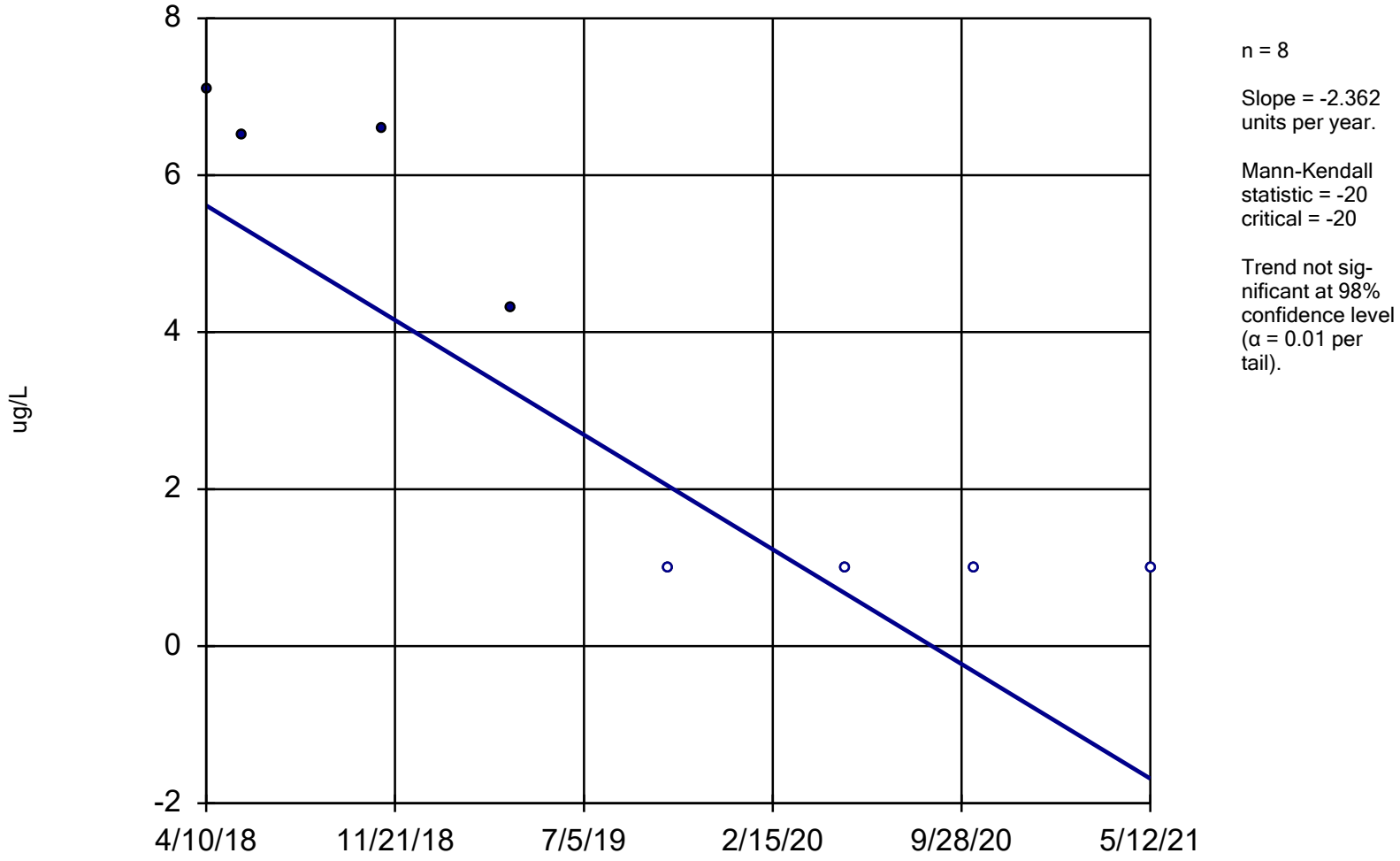
Sen's Slope Estimator Analysis Run 7/2/2021 3:48 PM

Client: Consumers Energy Data: JCW_HMPCCR_Sanitas_21Q2_backup

Hollow symbols indicate censored values.

Beryllium, Total

JCW-MW-15009



n = 8

Slope = -2.362 units per year.

Mann-Kendall statistic = -20
critical = -20

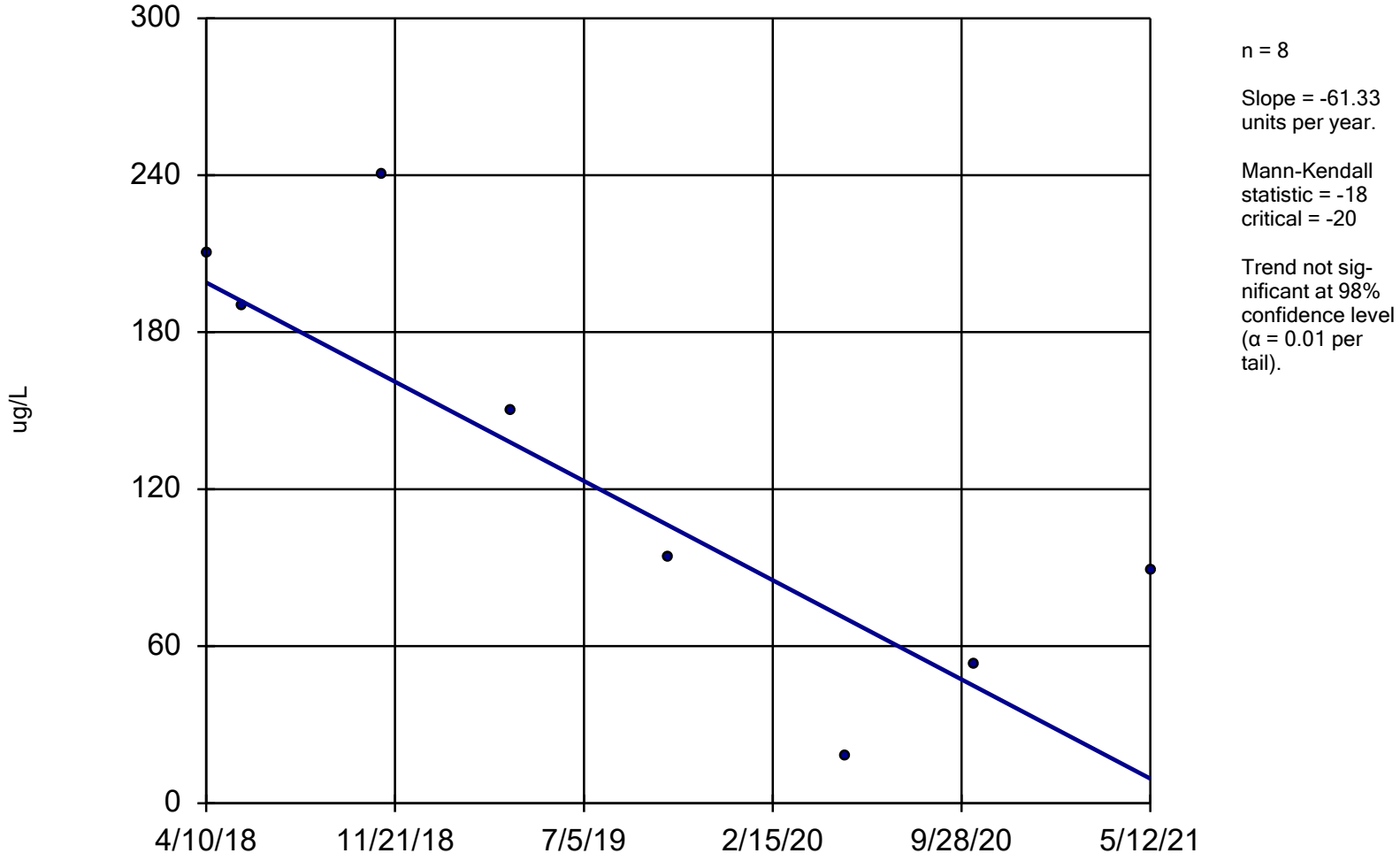
Trend not significant at 98% confidence level (α = 0.01 per tail).

Sen's Slope Estimator Analysis Run 7/2/2021 3:48 PM

Client: Consumers Energy Data: JCW_HMPCCR_Sanitas_21Q2_backup

Lithium, Total

JCW-MW-15009



n = 8

Slope = -61.33 units per year.

Mann-Kendall statistic = -18
critical = -20

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

Sen's Slope Estimator Analysis Run 7/2/2021 3:48 PM

Client: Consumers Energy Data: JCW_HMPCCR_Sanitas_21Q2_backup

Summary Report

Constituent: Arsenic, Total Analysis Run 6/18/2021 9:40 AM
Client: Consumers Energy Data: JCW_HMPCCR_Sanitas_21Q2

For observations made between 4/10/2018 and 5/12/2021, a summary of the selected data set:

Observations = 32
ND/Trace = 10
Wells = 4
Minimum Value = 1
Maximum Value = 61
Mean Value = 10.72
Median Value = 4
Standard Deviation = 14.61
Coefficient of Variation = 1.362
Skewness = 1.929

Well	#Obs.	ND/Trace	Min	Max	Mean	Median	Std.Dev.	CV	Skewness
JCW-MW-15007	8	0	9.8	61	30.43	28.3	16.77	0.551	0.6374
JCW-MW-15009	8	5	1	5	1.625	1	1.383	0.8513	2.147
JCW-MW-15010	8	0	4	16	9.55	10.45	4.47	0.468	-0.07738
JCW-MW-15028	8	5	1	3	1.288	1	0.6958	0.5404	2.22

Summary Report

Constituent: Barium, Total Analysis Run 6/18/2021 9:40 AM
Client: Consumers Energy Data: JCW_HMPCCR_Sanitas_21Q2

For observations made between 4/10/2018 and 5/12/2021, a summary of the selected data set:

Observations = 32
ND/Trace = 0
Wells = 4
Minimum Value = 12.3
Maximum Value = 2400
Mean Value = 431.8
Median Value = 185
Standard Deviation = 557.8
Coefficient of Variation = 1.292
Skewness = 1.898

Well	#Obs.	ND/Trace	Min	Max	Mean	Median	Std.Dev.	CV	Skewness
JCW-MW-15007	8	0	941	2400	1267	1015	520.4	0.4107	1.508
JCW-MW-15009	8	0	12.3	66	31.69	18.9	22.65	0.7148	0.5568
JCW-MW-15010	8	0	114	400	187	164	93.97	0.5025	1.601
JCW-MW-15028	8	0	148	342	241.3	240	84.6	0.3507	0.02388

Summary Report

Constituent: Beryllium, Total Analysis Run 6/18/2021 9:40 AM
Client: Consumers Energy Data: JCW_HMPCCR_Sanitas_21Q2

For observations made between 4/10/2018 and 5/12/2021, a summary of the selected data set:

Observations = 32
ND/Trace = 28
Wells = 4
Minimum Value = 1
Maximum Value = 7.1
Mean Value = 1.641
Median Value = 1
Standard Deviation = 1.765
Coefficient of Variation = 1.076
Skewness = 2.449

Well	#Obs.	ND/Trace	Min	Max	Mean	Median	Std.Dev.	CV	Skewness
JCW-MW-15007	8	8	1	1	1	1	0	0	NaN
JCW-MW-15009	8	4	1	7.1	3.563	2.65	2.858	0.8023	0.2011
JCW-MW-15010	8	8	1	1	1	1	0	0	NaN
JCW-MW-15028	8	8	1	1	1	1	0	0	NaN

Summary Report

Constituent: Lithium, Total Analysis Run 6/18/2021 9:40 AM
Client: Consumers Energy Data: JCW_HMPCCR_Sanitas_21Q2

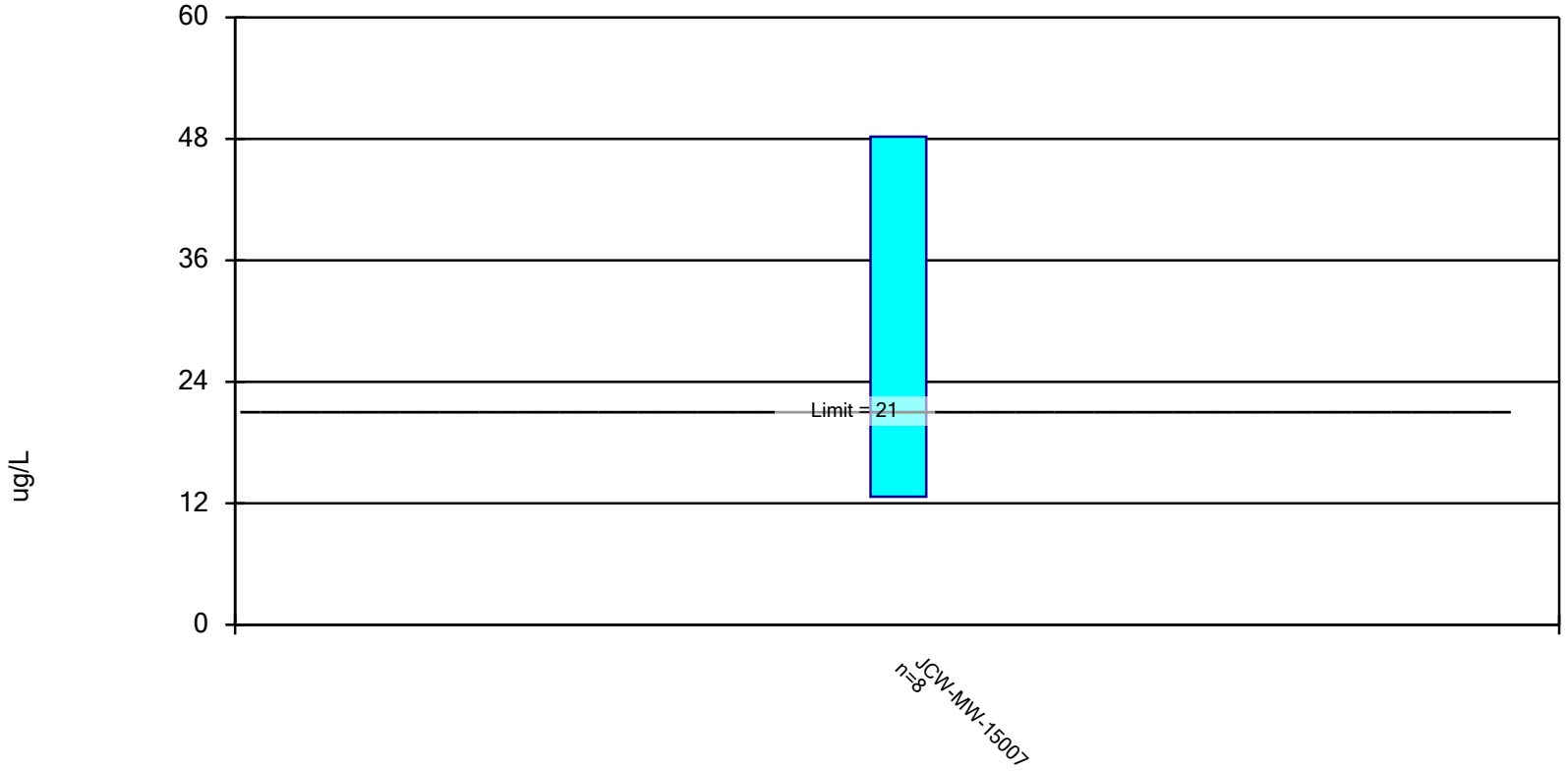
For observations made between 4/10/2018 and 5/12/2021, a summary of the selected data set:

Observations = 32
ND/Trace = 0
Wells = 4
Minimum Value = 18
Maximum Value = 240
Mean Value = 86.66
Median Value = 72.5
Standard Deviation = 48.41
Coefficient of Variation = 0.5586
Skewness = 1.768

Well	#Obs.	ND/Trace	Min	Max	Mean	Median	Std.Dev.	CV	Skewness
JCW-MW-15007	8	0	67	103	82.38	83.5	12.88	0.1564	0.2274
JCW-MW-15009	8	0	18	240	130.5	122	79.24	0.6072	0.00738
JCW-MW-15010	8	0	70	116	82.25	75	16.25	0.1976	1.257
JCW-MW-15028	8	0	48	60	51.5	51	4.036	0.07836	1.143

Parametric Confidence Interval

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



Constituent: Arsenic, Total Analysis Run 6/18/2021 9:44 AM

Client: Consumers Energy Data: JCW_HMPCCR_Sanitas_21Q2_backup

Confidence Interval

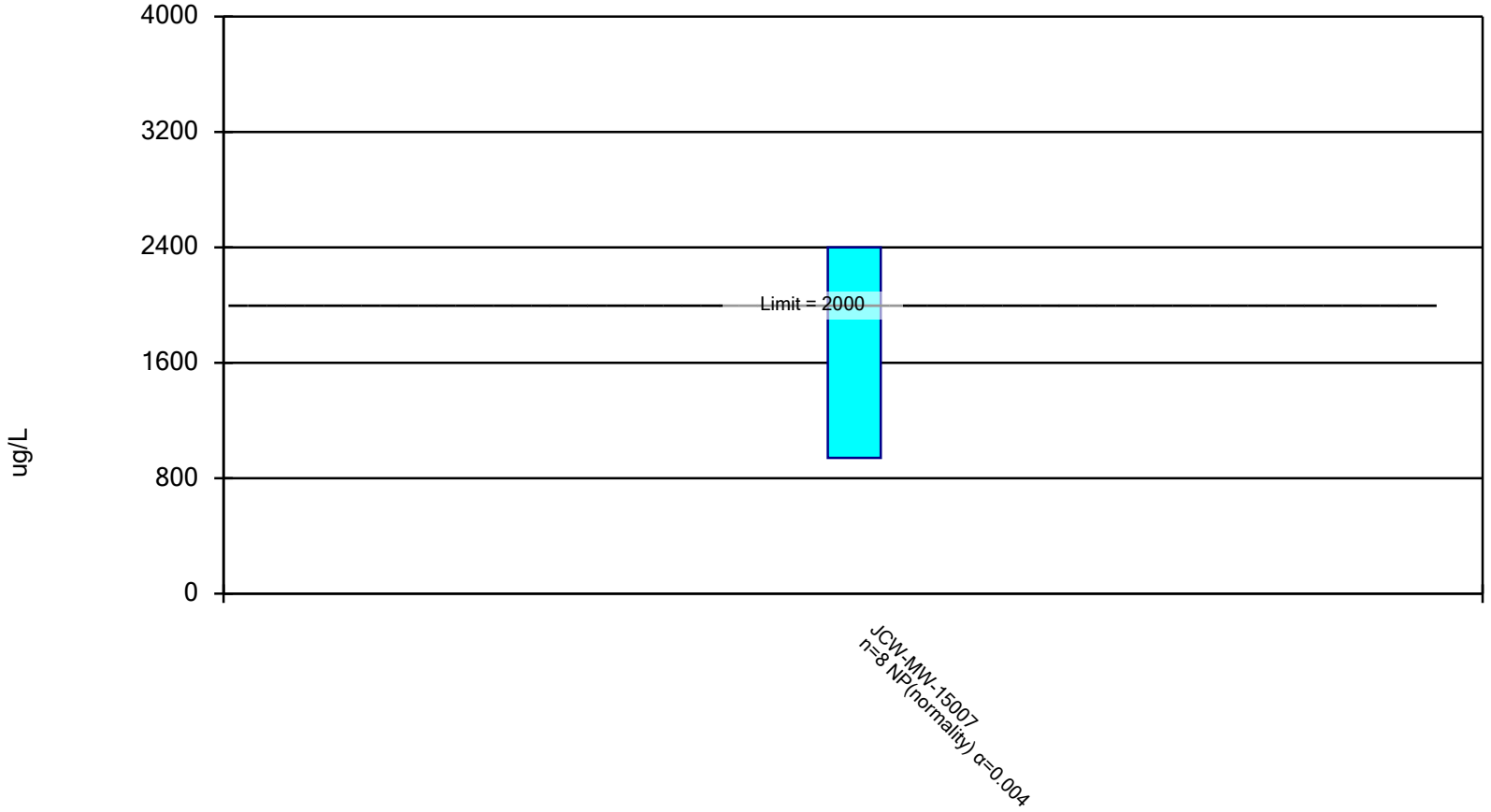
Constituent: Arsenic, Total (ug/L) Analysis Run 6/18/2021 9:45 AM

Client: Consumers Energy Data: JCW_HMPCCR_Sanitas_21Q2_backup

	JCW-MW-15007
4/10/2018	16.7
5/23/2018	25.6
11/7/2018	46.3
4/9/2019	9.8
10/15/2019	34
5/14/2020	19
10/13/2020	61
5/12/2021	31
Mean	30.43
Std. Dev.	16.77
Upper Lim.	48.2
Lower Lim.	12.65

Non-Parametric Confidence Interval

Compliance Limit is not exceeded.



Constituent: Barium, Total Analysis Run 6/18/2021 9:45 AM

Client: Consumers Energy Data: JCW_HMPCCR_Sanitas_21Q2_backup

Confidence Interval

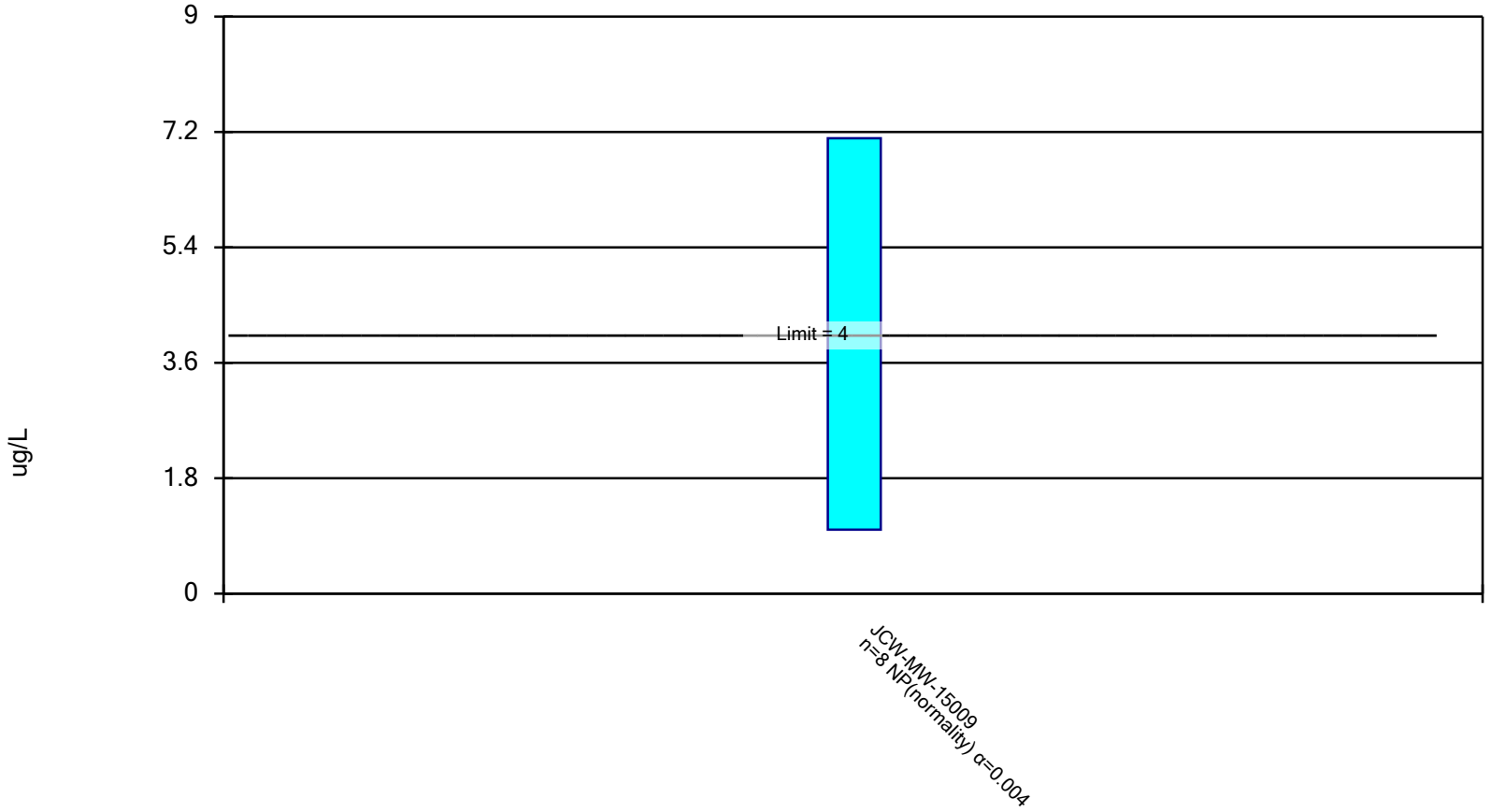
Constituent: Barium, Total (ug/L) Analysis Run 6/18/2021 9:45 AM

Client: Consumers Energy Data: JCW_HMPCCR_Sanitas_21Q2_backup

	JCW-MW-15007
4/10/2018	957
5/23/2018	941
11/7/2018	1060
4/9/2019	950
10/15/2019	970
5/14/2020	1180
10/13/2020	2400
5/12/2021	1680
Mean	1267
Std. Dev.	520.4
Upper Lim.	2400
Lower Lim.	941

Non-Parametric Confidence Interval

Compliance Limit is not exceeded.



Constituent: Beryllium, Total Analysis Run 6/18/2021 9:45 AM

Client: Consumers Energy Data: JCW_HMPCCR_Sanitas_21Q2_backup

Confidence Interval

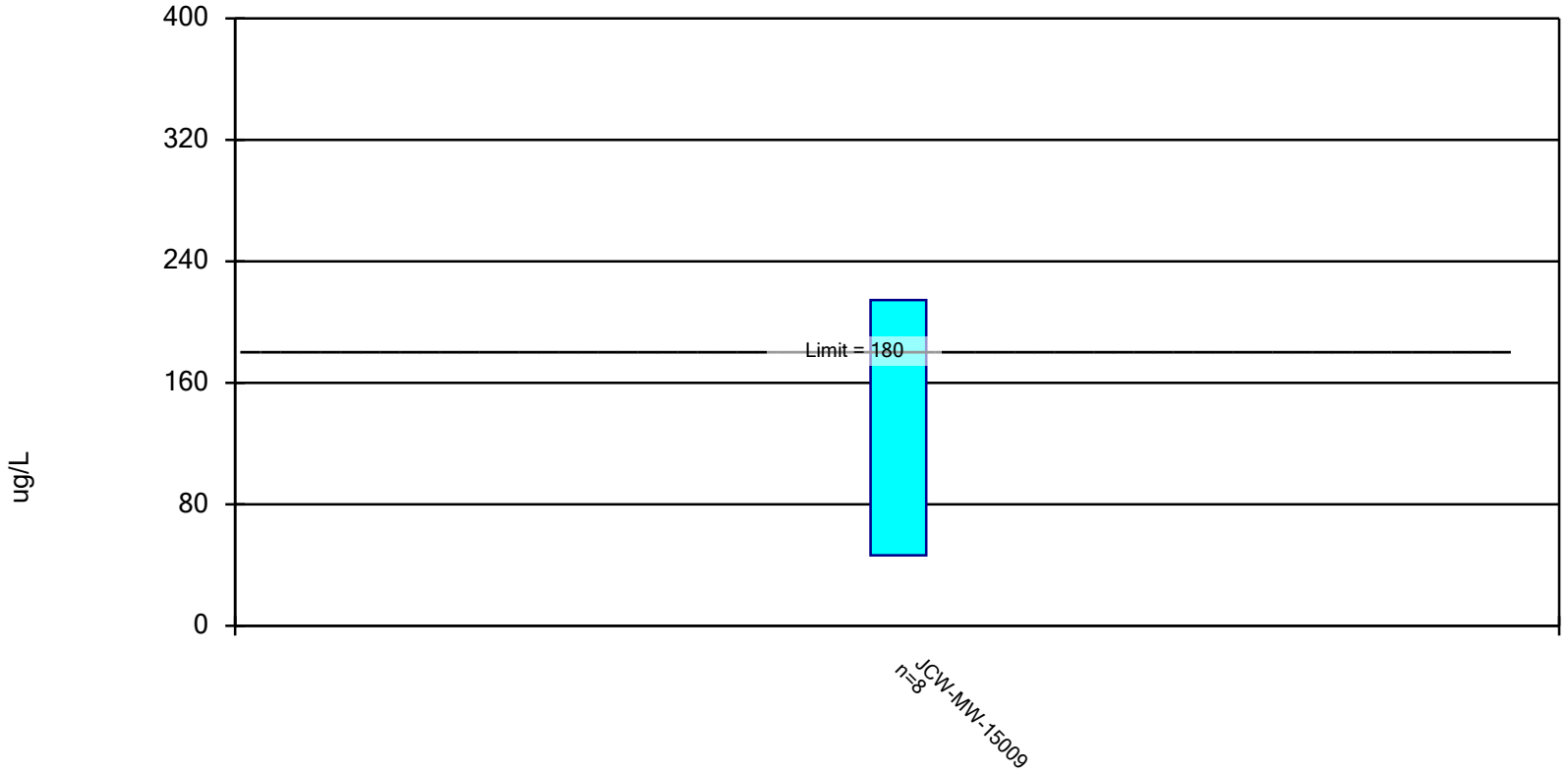
Constituent: Beryllium, Total (ug/L) Analysis Run 6/18/2021 9:45 AM

Client: Consumers Energy Data: JCW_HMPCCR_Sanitas_21Q2_backup

	JCW-MW-15009
4/10/2018	7.1
5/23/2018	6.5
11/7/2018	6.6
4/9/2019	4.3
10/15/2019	<1
5/14/2020	<1
10/13/2020	<1
5/12/2021	<1
Mean	3.563
Std. Dev.	2.858
Upper Lim.	7.1
Lower Lim.	1

Parametric Confidence Interval

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



Constituent: Lithium, Total Analysis Run 6/18/2021 9:45 AM

Client: Consumers Energy Data: JCW_HMPCCR_Sanitas_21Q2_backup

Confidence Interval

Constituent: Lithium, Total (ug/L) Analysis Run 6/18/2021 9:45 AM

Client: Consumers Energy Data: JCW_HMPCCR_Sanitas_21Q2_backup

	JCW-MW-15009
4/10/2018	210
5/23/2018	190
11/7/2018	240
4/9/2019	150
10/15/2019	94
5/14/2020	18
10/13/2020	53
5/12/2021	89
Mean	130.5
Std. Dev.	79.24
Upper Lim.	214.5
Lower Lim.	46.52