

January 28, 2022

TRANSMITTAL VIA EMAIL 01/28/2022

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: 2021 Annual Groundwater Monitoring and Corrective Action Report §257.90(e)
inclusive of the Semiannual Progress Report §257.97(a)
DE Karn Bottom Ash Pond Coal Combustion Residuals (CCR) Unit

Dear Ms. Babcock,

On April 17, 2015, the United States Environmental Protection Agency (USEPA) published the final rule for the regulation and management of Coal Combustion Residuals (CCR) under the Resource Conservation and Recovery Act (RCRA) (the CCR Rule) (USEPA, April 2015 as amended). Standards for groundwater monitoring and corrective action codified in the CCR Rule (40 CFR 257.90 – 257.98), apply to the Consumers Energy Company (Consumers Energy) Bottom Ash Pond CCR Unit at the DE Karn Power Plant Site. Pursuant to the CCR Rule, no later than January 31, 2018, and annually thereafter, the owner or operator of a CCR unit must prepare an annual groundwater monitoring and corrective action report for the CCR unit documenting the status of groundwater monitoring and corrective action for the preceding year in accordance with §257.90(e). This *2021 Annual Groundwater Monitoring and Corrective Action* report documents activities from January 2021 through December 2021.

This letter along with the May 2021 and October 2021 semiannual groundwater sampling reports for the Karn Bottom Ash Pond (Enclosures 2 and 3) and a technical memorandum discussing the nature and extent of contamination characterization (Enclosure 4) collectively comprise the 2021 Annual Groundwater Monitoring and Corrective Action Report and meet the requirements of §257.90(e) as documented in the enclosed checklist (Enclosure 1).

The Karn Bottom Ash Pond was in assessment monitoring at the beginning and at the end of the period covered by this report. Consumers Energy will continue to evaluate corrective measures per §257.96 and §257.97 and is continuing semiannual assessment monitoring in accordance with §257.95.

Karn Bottom Ash Pond Assessment Activities

Consumers Energy prepared and submitted to the Michigan Department of Environment, Great Lakes, and Energy (EGLE) a closure work plan for the Karn Bottom Ash Pond (Karn Bottom Ash Pond Work Plan) and a Response Action Plan developed 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 Karn Bottom Ash Pond. Consumers Energy provided notification of exceeding a Groundwater Protection

Standard (GWPS), per §257.95(g) on January 14, 2019, that indicated arsenic was present at statistically significant levels above the GWPS in five of six downgradient wells at the Karn Bottom Ash Pond.

EGLE approved the Karn 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 submitted for review and approval, D.E. Karn Generating Facility Bottom Ash Pond CCR Removal Documentation Report (Karn Bottom Ash Pond Closure Report) on October 30, 2019 to satisfy requirements for completing the removal of solid waste which rendered the need for a solid waste operating license was unnecessary.

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 any additional remedy for the Karn Bottom Ash Pond after the completion of the Assessment of Corrective Measures, DE Karn Bottom Ash Pond Coal Combustion Residual Unit, dated September 11, 2019 (Karn Bottom Ash Pond ACM) (TRC, 2019). Groundwater management alternatives considered to be technically feasible following source removal activities that could potentially address the residual arsenic under known groundwater conditions were identified in the report as: 1) Post-remedy monitoring, 2) Groundwater capture/control, 3) Impermeable barrier, 4) Active geochemical sequestration, and 5) Passive geochemical sequestration.

Results of the May 2021 and October 2021 Sampling Events

Statistical analysis from the May and October 2021 assessment groundwater monitoring events verified that the only constituent of concern that is present at statistically significant levels above the established Groundwater Protection Standard (GWPS) is arsenic. Results are presented in the enclosed May 2021 Assessment Monitoring Data Summary and Statistical Evaluation Consumers Energy, DE Karn Site, Bottom Ash Pond CCR Unit (Enclosure 2) and October 2021 Assessment Monitoring Data Summary and Statistical Evaluation Consumers Energy, DE Karn Site, Bottom Ash Pond CCR Unit (Enclosure 3). Additionally, monitoring performed under the Karn 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. These results are depicted in Figure 2 of the Second Semiannual 2021 Nature and Extent Data Summary, DE Karn, Consumers Energy, Essexville, Michigan (Enclosure 4).

Significant observations from the event summaries are as follows:

- Monitoring Wells DEK-MW-15003 and DEK-MW-15004 are no longer downgradient and indicative of determining attainment of GWPS for arsenic or detecting new releases from the former Karn Bottom Ash Pond. Therefore, the Karn Bottom Ash Pond groundwater monitoring system was recertified with downgradient monitoring wells DEK-MW-15002, DEK-MW-15005, DEK-MW-15006, and DEK-MW-18001;
- No additional Appendix IV constituents have been observed at statistically significant levels above GWPS for the Karn Bottom Ash Pond groundwater monitoring system;

- Groundwater potentiometric surface exhibits flow within the area of the former Karn Bottom Ash as primarily moving west towards the intake channel, or south towards the Karn Generating Plant. Regionally, a radial flow still exists, but the “high” point has shifted from the former Karn Bottom Ash Pond pool area to an area delineated by Monitoring Wells OW-11 and DEK-MW-15003;
- Arsenic concentration trends in DEK-MW-15005 and DEK-MW-15006 adjacent to the Karn Intake Channel are generally stable and trends in DEK-MW-18001 are generally declining; and
- Arsenic concentrations at DEK-MW-15002 has a statistically significant decreasing trend based on the previous eight events and arsenic concentrations have been below the GWPS since April 2019.

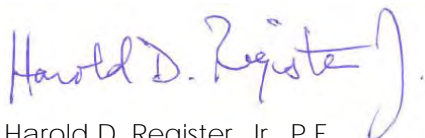
Conclusions

Source removal activities for the Karn Bottom Ash Pond have been completed and documented in the Karn Bottom Ash Pond Closure Report submitted to EGLE on October 30, 2019. 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. To aid in the further evaluation, Consumers Energy will be installing additional monitoring wells within the former Karn Bottom Ash Pond area to be integrated into the 2022 sampling schedule. Subsequent sampling events to include the additional monitoring wells 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 Karn Bottom Ash Pond 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 July 30, 2022. Please feel free to contact me with any questions or clarifications.

Sincerely,



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Mr. Jacob Krenz, TRC

Enclosures: 1) CCR Annual Groundwater Report Requirements: § 257.90(e). Checklist for the Karn Bottom Ash Pond CCR Unit.

2) May 2021 Assessment Monitoring Data Summary and Statistical Evaluation Consumers Energy, DE Karn Site, Bottom Ash Pond CCR Unit. (TRC, July 30, 2021).

3) October 2021 Assessment Monitoring Data Summary and Statistical Evaluation Consumers Energy, DE Karn Site, Bottom Ash Pond CCR Unit. (TRC, January 28, 2022).

4) Second Semiannual 2021 Nature and Extent Data Summary, DE Karn, Consumers Energy, Essexville, Michigan. (TRC, January 28, 2022).

CCR Annual Groundwater Report Requirements: § 257.90(e)
Checklist for the Karn Bottom Ash Pond CCR Unit
2021 Annual Report

Requirement	Reference
At a minimum, the annual groundwater monitoring and corrective action report must contain the following information, to the extent available:	
(1) A map, aerial image, or diagram showing the CCR unit and all background (or upgradient) and downgradient monitoring wells, to include the well identification numbers, that are part of the groundwater monitoring program for the CCR unit;	Figure 2 ⁽³⁾
(2) Identification of any monitoring wells that were installed or decommissioned during the preceding year, along with a narrative description of why those actions were taken;	Not Applicable - no installation or decommissioning
(3) In addition to all the monitoring data obtained under §§ 257.90 through 257.98, a summary including the number of groundwater samples that were collected for analysis for each background and downgradient well, the dates the samples were collected, and whether the sample was required by the detection monitoring or assessment monitoring programs;	Section 2.2 ^{(2),(3)}
(4) A narrative discussion of any transition between monitoring programs (e.g., the date and circumstances for transitioning from detection monitoring to assessment monitoring in addition to identifying the constituent(s) detected at a statistically significant increase over background levels); and	Corrective Action Progress Report ⁽¹⁾ ; Section 1.1 Program Summary ^{(2),(3)}
(5) Other information required to be included in the annual report as specified in §§ 257.90 through 257.98.	Nature and Extent Data Summary ⁽⁴⁾ ; Monitoring Well Network Recertification ⁽³⁾
(6) A section at the beginning of the annual report that provides an overview of the current status of groundwater monitoring and corrective action programs for the CCR unit. At a minimum, the summary must specify all of the following:	
(i) At the start of the current annual reporting period, whether the CCR unit was operating under the detection monitoring program in § 257.94 or the assessment monitoring program in § 257.95;	Corrective Action Progress Report ⁽¹⁾ ; Section 1.1 Program Summary ^{(2),(3)}
(ii) At the end of the current annual reporting period, whether the CCR unit was operating under the detection monitoring program in § 257.94 or the assessment monitoring program in § 257.95;	Corrective Action Progress Report ⁽¹⁾ ; Section 1.1 Program Summary ^{(2),(3)}
(iii) If it was determined that there was a statistically significant increase over background for one or more constituents listed in appendix III to this part pursuant to § 257.94(e):	Section 1.1 Program Summary ^{(2),(3)}
(A) Identify those constituents listed in appendix III to this part and the names of the monitoring wells associated with such an increase; and	Section 1.1 Program Summary ^{(2),(3)}
(B) Provide the date when the assessment monitoring program was initiated for the CCR unit.	Section 1.1 Program Summary ^{(2),(3)}
(iv) If it was determined that there was a statistically significant level above the groundwater protection standard for one or more constituents listed in appendix IV to this part pursuant to § 257.95(g) include all of the following:	Corrective Action Progress Report ⁽¹⁾ ; Section 1.1 Program Summary ^{(2),(3)}
(A) Identify those constituents listed in appendix IV to this part and the names of the monitoring wells associated with such an increase;	Section 1.1 Program Summary ^{(2),(3)}
(B) Provide the date when the assessment of corrective measures was initiated for the CCR unit;	Section 1.1 Program Summary ⁽³⁾
(C) Provide the date when the public meeting was held for the assessment of corrective measures for the CCR unit; and	Not Applicable - final remedy still under evaluation
(D) Provide the date when the assessment of corrective measures was completed for the CCR unit.	Corrective Action Progress Report ⁽¹⁾ ; Section 1.1 Program Summary ^{(2),(3)}
(v) Whether a remedy was selected pursuant to § 257.97 during the current annual reporting period, and if so, the date of remedy selection; and	Corrective Action Progress Report ⁽¹⁾ ; final remedy still under evaluation
(vi) Whether remedial activities were initiated or are ongoing pursuant to § 257.98 during the current annual reporting period.	Corrective Action Progress Report ⁽¹⁾ ; final remedy still under evaluation

Notes:

(1) 2021 Annual Groundwater Monitoring and Corrective Action Report DE Karn Bottom Ash Pond Coal Combustion Residuals CCR Units. Consumers Energy. January 28, 2022.

(2) May 2021 Assessment Monitoring Data Summary and Statistical Evaluation Consumers Energy, DE Karn Site, Bottom Ash Pond CCR Unit. TRC. July 30, 2021, Revised January 2022.

(3) October 2021 Assessment Monitoring Data Summary and Statistical Evaluation Consumers Energy, DE Karn Site, Bottom Ash Pond CCR Unit. TRC. January 28, 2022.

(4) Second Semiannual 2021 Nature and Extent Data Summary, DE Karn, Consumers Energy, Essexville, Michigan. TRC. January 28, 2022.



May 2021 Assessment Monitoring Data Summary and Statistical Evaluation

DE Karn, Bottom Ash Pond CCR Unit

Essexville, Michigan

July 2021, Revised January 2022

A handwritten signature in blue ink that reads "Darby Litz".

Darby Litz
Hydrogeologist/Project Manager

Prepared For:

Consumers Energy Company

Prepared By:

TRC
1540 Eisenhower Place
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A handwritten signature in blue ink that reads "Jake Krenz".

Jake Krenz
Staff Geologist

TABLE OF CONTENTS

1.0	Introduction.....	1
1.1	Program Summary	1
1.2	Site Overview	3
1.3	Geology/Hydrogeology	4
2.0	Groundwater Monitoring	5
2.1	Monitoring Well Network.....	5
2.2	May 2021 Assessment Monitoring.....	5
	2.2.1 Groundwater Flow Rate and Direction.....	6
	2.2.2 Data Quality	7
3.0	Assessment Monitoring Statistical Evaluation.....	8
3.1	Establishing Groundwater Protection Standards.....	8
3.2	Data Comparison to Groundwater Protection Standards	8
4.0	Conclusions and Recommendations	10
5.0	References	11

TABLES

Table 1	Summary of Groundwater Elevation Data
Table 2	Summary of Field Parameter Results
Table 3	Summary of Background Wells Groundwater Sampling Results (Analytical)
Table 4	Summary of Groundwater Sampling Results (Analytical)
Table 5	Summary of Groundwater Protection Standard Exceedances – May 2021

FIGURES

Figure 1	Site Location Map
Figure 2	Karn and Weadock Complex Map
Figure 3	Shallow Groundwater Contour Map – May 2021

APPENDICES

Appendix A	Data Quality Reviews
Appendix B	Statistical Evaluation of May 2021 Assessment Monitoring Sampling Event
Appendix C	Groundwater Flow Evaluation
Appendix D	Laboratory Analytical Reports

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 DE Karn Bottom Ash Pond CCR Unit (Karn Bottom Ash Pond).

Consumers Energy is continuing semiannual assessment monitoring in accordance with §257.95 of the CCR Rule for the Karn Bottom Ash Pond located in Essexville, Michigan. This 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 Karn Bottom Ash Pond groundwater system.

1.1 Program Summary

Groundwater monitoring for the Karn 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 DE Karn Power Plant Bottom Ash Pond CCR Unit* (TRC, January 2018). The statistical evaluation of the Appendix III indicator parameters confirming statistically significant increases (SSIs) over background were as follows:

- Boron at DEK-MW-15001, DEK-MW-15002, DEK-MW-15003, DEK-MW-15004, DEK-MW-15005, DEK-MW-15006;
- Fluoride at DEK-MW-15001;
- Field pH at DEK-MW-15001, DEK-MW-15002, DEK-MW-15003, DEK-MW-15005, DEK-MW-15006; and
- Sulfate at DEK-MW-15006.

On April 25, 2018, Consumers Energy entered assessment monitoring upon determining that an Alternate Source Demonstration for the Appendix III constituents was not successful. After subsequent sampling for Appendix IV constituents, Consumers Energy provided notification that arsenic was present at statistically significant levels above the Ground Water Protection Standards (GWPS) established at 21 ug/L (Consumers Energy, January 2019) in five of the six downgradient monitoring wells at the Karn Bottom Ash Pond as follows:

- Arsenic at DEK-MW-15001, DEK-MW-15002, DEK-MW-15003, DEK-MW-15004, and DEK-MW-15005.

The notification of the GWPS exceedance on January 14, 2019 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 arsenic concentrations exceed the GWPS in on-site groundwater monitoring locations, arsenic is 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 Karn Bottom Ash Pond. Per §257.96(b), Consumers Energy is continuing to monitor groundwater in accordance with the assessment monitoring program as specified in §257.95.

Evaluation of groundwater under the CCR Rule focused on the following constituents that were 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

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.

Additional Monitoring Constituents (Michigan Part 115/PA 640 ¹)	
Detection Monitoring	Assessment Monitoring
	Nickel
	Silver
	Vanadium
	Zinc

Consumers Energy will continue to evaluate corrective measures for the Karn 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 Karn Bottom Ash Pond is located within the DE Karn Power Plant site, which is located north of the JC Weadock Power Plant, east of the Saginaw River, south and west of Saginaw Bay (Figure 1). Two coal-fired power generating units (Karn Units 1 & 2) began generating electricity in 1958 and 1959, respectively. Karn Units 3 & 4, co-located with the coal-fired generating units, are oil- and natural gas-fueled. Two other areas of coal ash management within the Karn site are the Karn Landfill and the Karn Lined Impoundment. The Karn Landfill has been certified closed and is now in post-closure care and is being monitored in accordance with the EGLE-approved *Hydrogeological Monitoring Plan, Rev. 3, DE Karn Solid Waste Disposal Area* (December 19, 2017). The Karn Lined Impoundment has been licensed to operate by the EGLE under Part 115 (License Number 9629) and is being monitored in accordance with the EGLE-approved Karn Lined Impoundment Hydrogeological Monitoring Plan (November 13, 2020). The locations of the Karn Landfill, the Karn Lined Impoundment, and the Karn Bottom Ash Pond are shown on Figure 2.

Previously, the Karn Bottom Ash Pond was used for wet ash dewatering and was the primary settling/detention structure for the National Pollutant Discharge Elimination System (NPDES) treatment system prior to discharge. Consumers Energy provided notification of initiation of closure on October 12, 2018 to implement the certified closure plan by removal of CCR under the self-implementing requirements and schedule of the CCR Rule. In preparation for removal of the Karn Bottom Ash Pond, a new lined impoundment (Karn Lined Impoundment) was constructed meeting the requirements of the CCR Rule and the operational needs at the Karn Power Plant. The Karn Lined Impoundment began receipt of CCR and non-CCR on June 7, 2018 when it replaced the Karn Bottom Ash Pond operations.

Consumers Energy has completed the removal of CCR consistent with the timeline for closure of the Karn Bottom Ash Pond under the *DE Karn Bottom Ash Pond Closure Plan* (Golder, January 2018; Revised April 2018) and the CCR Rule’s closure by removal provisions in §257.102(c). Consumers Energy ceased hydraulic loading to the Karn Bottom Ash Pond in June 2018 and allowed the area to dewater by gravity. Consumers Energy then operated a construction dewatering system to allow for excavation of the vertical and lateral extent of CCR that commenced on March 20, 2019 and has operated through the construction and restoration

period. 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 Karn 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 constituents of concern (COCs). With the CCR removal complete, Consumers Energy submitted the *DE Karn Generating Facility Bottom Ash Pond CCR Removal Documentation Report* (Golder, October 2019) on October 30, 2019. EGLE approved the documentation removal report on December 1, 2020. Groundwater conditions post-CCR removal continue to be monitored.

1.3 Geology/Hydrogeology

The majority of the Karn 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 (AECOM, 2009).

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 to 30 feet below ground surface (ft bgs) overlying a clay till which is observed at depths ranging from 25 to 75 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. The clay till acts as a hydraulic barrier that separates the shallow groundwater from the underlying sandstone. A sandstone unit, which is part of the Saginaw formation, was generally encountered at 80 to 90 ft bgs.

The DE Karn Power Plant site is bounded by several surface water features (Figure 1): the Saginaw River to the west, Saginaw Bay (Lake Huron) to the north and east, and a discharge channel to the south. In general, shallow groundwater is encountered at a similar or slightly higher elevation relative to the surrounding surface water features. Groundwater flow in the upper aquifer is largely controlled by the surface water elevations of Saginaw River and Saginaw Bay. In the vicinity of the Karn Bottom Ash Pond, the shallow groundwater flow is generally to the west, toward the intake channel.

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 Karn Bottom Ash Pond, which consists of 10 monitoring wells (four background monitoring wells and six downgradient monitoring wells) that are screened in the uppermost aquifer. The monitoring well locations are shown on Figure 2.

Groundwater around the Karn Bottom Ash Pond was initially characterized as radial based on the eight initial background sampling events prior to commencing detection monitoring; therefore, six downgradient wells (DEK-MW-15001 through DEK-MW-15006) that were installed and spaced along the circumference of the Karn Bottom Ash Pond 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. Monitoring well DEK-MW-15001 was decommissioned on April 18, 2018 due to the installation of the new Karn Lined Impoundment, which is a new double composite lined CCR unit constructed as a replacement to the Karn Bottom Ash Pond. Monitoring well DEK-MW-18001 was installed on May 21, 2018 approximately 80 feet southeast of DEK-MW-15001 to maintain the perimeter downgradient monitoring well network.

Four monitoring wells located south of the Karn Bottom Ash Pond on the JC Weadock Power Plant site provide data on background groundwater quality that has not been affected by the 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* for the Karn Bottom Ash Pond, dated October 17, 2017.

2.2 May 2021 Assessment Monitoring

Per §257.95, all wells in the CCR unit groundwater monitoring program must be sampled semiannually. TRC conducted the first semiannual assessment monitoring event of 2021 for Appendix III and IV constituents at the Karn Bottom Ash Pond CCR Unit in accordance with the *DE Karn Monitoring Program Sample Analysis Plan* (ARCADIS, May 2016) (SAP). The semiannual assessment monitoring event was performed on May 3 through May 6, 2021.

The May 2021 sampling event included collection of static water level measurements from the Karn Bottom Ash Pond groundwater monitoring system and 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. The Karn Bottom Ash Pond monitoring wells (DEK-MW-15002 through DEK-MW-15006 and DEK-MW-18001) and background monitoring wells (MW-15002, MW-15008, MW-15016, and MW-15019) 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.

The groundwater samples were analyzed by the Consumers Energy Trail Street Laboratory for Appendix III and IV constituents in accordance with the SAP. Radium analyses were completed

by Eurofins TestAmerica Inc. (TestAmerica). The analytical results for the background wells are summarized in Table 3, and the analytical results for the 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 measured at the site in May 2021 are generally within the range of 581 to 587 feet above mean sea level (ft NAVD88) and groundwater is typically encountered at equal elevation relative to the surrounding surface water features measured by the NOAA gauging station or within approximately 6 feet higher, flowing toward the bounding surface water features.

Although historically the point source discharge of sluiced bottom ash into the Karn Bottom Ash Pond created localized mounding of the potentiometric surface, the new Karn Lined Impoundment went into service on June 7, 2018 and has been continuously collecting the process water and bottom ash that went into the former bottom ash pond. Since the former bottom ash pond is no longer being hydraulically loaded with sluiced ash and has been dewatered by gravity, the characteristic groundwater mound centered within the pooled area is no longer present. The groundwater elevation data collected from the groundwater monitoring system of the former bottom ash pond in May 2021 demonstrate a reduction in groundwater elevation measurements by several feet when compared to groundwater elevations measured prior to June 2018. Due to the operational changes of the bottom ash pond and the completion of the landfill capping activities, the gradient between the bottom ash pond area and the surrounding surface water bodies is flattening out as compared to previous quarters as the groundwater elevations are reaching a new equilibrium, as expected. Groundwater at the facility is locally influenced by incidental infiltration from precipitation over the uncovered acreage. Monitoring Wells OW-11 and DEK-MW-15003 delineate the newly established groundwater elevation high point with porewater flow generally flowing radially towards the adjacent surface water features from this newly established potentiometric “high”, as illustrated in Figure 3. As such, the groundwater flow across the footprint of the former bottom ash pond is generally to the west.

The average hydraulic gradient observed on May 3, 2021 in the Karn Bottom Ash Pond area during these events is estimated at 0.0050 ft/ft. The gradient was calculated using the monitoring well pair DEK-MW-15004/DEK-MW-15005, as well as the well water elevation difference and distance between DEK-MW-15003/DEK-MW-15006. Using the mean hydraulic conductivity of 15 ft/day (ARCADIS, 2016) and an assumed effective porosity of 0.3, the estimated average seepage velocity was 0.25 ft/day or 91 ft/year.

Appendix C includes a series of groundwater contour maps to illustrate the changes in groundwater flow direction from 2015, when the monitoring well network was originally established and background sampling was initiated, to the most recent May 2021 groundwater sampling event. Given this shift in groundwater flow direction, DEK-MW-15003 and DEK-MW-15004 are now located upgradient to side gradient of the CCR unit and are no longer

representative of groundwater chemistry downgradient of the Karn Bottom Ash Pond. Therefore, DEK-MW-15003 and DEK-MW-15004 will no longer be used for assessment monitoring or for evaluating the effectiveness of the CCR removal activities.

2.2.2 Data Quality

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 Karn Bottom Ash Pond while Consumers Energy further evaluates corrective measures 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 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 of any Appendix IV constituent. As documented in the January 14, 2019 *Notification of Appendix IV Constituent Exceeding Groundwater Protection Standard per §257.95(g)*, arsenic was present at statistically significant levels above the federal GWPS in five of the six downgradient wells at the Karn Bottom Ash Pond.

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 their respective GWPS. 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 arsenic is the only Appendix IV constituent present at statistically significant levels above the GWPS. The statistical evaluation of the May 2021 semiannual assessment monitoring event data indicate that arsenic is present at statistically significant levels exceeding the GWPS in downgradient monitoring wells at the Karn Bottom Ash Pond:

Constituent	GWPS	#Downgradient Wells Observed
--------------------	-------------	-------------------------------------

Arsenic	21 ug/L	2 of 4
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Due to changes in groundwater flow direction on site, monitoring wells DEK-MW-15003 and DEK-MW-15004 are no longer located downgradient of the unit and were determined to be no longer indicative of groundwater conditions influenced by the Karn Bottom Ash Pond. Therefore, monitoring wells DEK-MW-15003 and DEK-MW-15004 are no longer included for assessment monitoring statistical analysis. The monitoring well network for statistical evaluation consists of the four monitoring wells located downgradient of the bottom ash pond (DEK-MW-15002, DEK-MW-15005, DEK-MW-15006, and DEK-MW-18001). Previously, arsenic was present in downgradient well DEK-MW-15002 at a statistically significant level; however, the statistical evaluation of the October 2020 and May 2021 data show that the lower confidence limit for arsenic is currently below the GWPS. A summary of the confidence intervals for May 2021 is provided in Table 5.

Arsenic concentrations at DEK-MW-15002, and DEK-MW-18001 appear to exhibit a downward trend on the time-series chart (Appendix B: 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 showed that arsenic concentrations are generally decreasing with time, as evidenced by the negative Sen's Slope, and that the downward trend of arsenic at DEK-MW-15002 is statistically significant.

4.0 Conclusions and Recommendations

Corrective action has been triggered and assessment monitoring is ongoing at the Karn 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 arsenic is the only Appendix IV constituent present at statistically significant levels above the GWPS. Consumers Energy has completed the removal of CCR consistent with the timeline for closure of the Karn Bottom Ash Pond under the *DE Karn Bottom Ash Pond Closure Plan* (Golder, January 2018; Revised April 2018) and the CCR Rule's closure by removal provisions in §257.102(c).

The ACM Report provided a high-level assessment of groundwater remediation technologies that could potentially address site-specific COCs (i.e., arsenic) under known groundwater conditions. Groundwater chemistry already appears to be improving as a result of discontinuing the hydraulic loading to the Karn Bottom Ash Pond and the completed source removal of CCR, as shown by the decreasing concentrations of arsenic at DEK-MW-15002 and DEK-MW-18001; however, attainment of the GWPS at all of the Bottom Ash Pond compliance wells may not be feasible due to influences other than the former pond, such as the presence and former operation of the nearby Karn Landfill. Redox conditions, which affect contaminant transport, are still stabilizing following pond removal and will continue to be evaluated further.

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

5.0 References

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Tables

Table 1
 Summary of Groundwater Elevation Data
 DE Karn – RCRA CCR Monitoring Program
 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					
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
DEK Bottom Ash Pond					
DEK-MW-15002	590.87	Sand	578.3 to 575.3	6.75	584.12
DEK-MW-15004	611.04	Sand	576.6 to 571.6	27.75	583.29
DEK-MW-15005	589.72	Sand	572.3 to 567.3	8.78	580.94
DEK-MW-15006	589.24	Sand	573.0 to 568.0	8.28	580.96
DEK Bottom Ash Pond & Karn Lined Impoundment					
DEK-MW-15003	602.74	Sand	578.8 to 574.8	15.40	587.34
DEK-MW-18001	593.47	Sand	579.2 to 574.2	8.41	585.06
OW-10	591.58	Silty Sand and Silty Clay	576.0 to 571.0	6.75	584.83
OW-11	607.90	Silt/Fly Ash	587.5 to 582.5	21.35	586.55
OW-12	603.07	Silty Sand	584.2 to 579.2	17.10	585.97
DEK Nature and Extent					
MW-01	597.02	Sand	573.0 to 570.0	16.10	580.92
MW-03	597.30	Sand	569.8 to 566.8	16.36	580.94
MW-06	589.44	Sand and Silty Sand	578.5 to 563.5	8.30	581.14
MW-08	598.78	Sand and Silty Clay	580.9 to 570.9	17.22	581.56
MW-10	596.97	Sand	582.5 to 572.5	16.00	580.97
MW-12	598.60	Sand	583.9 to 573.9	17.55	581.05
MW-14	594.37	Sand and Silty Clay	584.7 to 574.7	13.45	580.92
MW-16	595.80	Sand and Sand/Bottom Ash	584.1 to 574.1	14.92	580.88
MW-22	598.99	Ash/Sand	571.4 to 568.4	16.29	582.70
MW-23	595.57	Ash/Sand	576.9 to 571.9	13.09	582.48
DEK Static Water Level					
MW-02	597.34	Sand and Silty Clay	572.5 to 567.5	16.42	580.92
MW-04	598.01	NR	569.5 to 564.5	17.09	580.92
MW-17	597.91	Sand	577.0 to 574.0	13.00	584.91
MW-18	609.22	Silty Sand and Silty Clay	575.8 to 573.8	25.33	583.89
MW-19	597.28	NR	572.1 to 567.1	16.10	581.18
MW-20	632.75	Sand	582.3 to 579.3	51.73	581.02
MW-21	632.91	Sand	587.1 to 584.1	50.55	582.36
OW-01	631.33	NR	572.5 to 567.5	50.33	581.00
OW-02	598.01	Fly Ash	579.4 to 576.4	15.18	582.83
OW-03	597.94	Fly Ash and Sand	573.6 to 568.6	16.88	581.06
OW-04	590.21	Sand and Bottom/Fly Ash	579.1 to 574.1	9.26	580.95
OW-05	593.53	Sand	576.9 to 571.9	12.30	581.23
OW-06	603.95	NR	580.9 to 575.9	21.10	582.85
OW-07	596.41	Ash	583.3 to 580.3	13.38	583.03
OW-08	593.93	NR	581.0 to 576.0	10.66	583.27
OW-09	593.45	NR	585.5 to 580.5	10.12	583.33
OW-13	588.52	NR	579.5 to 574.5	4.68	583.84
OW-15	587.75	NR	572.8 to 567.8	4.00	583.75

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.
 NR: Not Recorded

Table 2
 Summary of Field Parameters: May 2021
 DE Karn Bottom Ash Pond – 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
Karn Bottom Ash Pond							
DEK-MW-15002	5/3/2021	0.09	-181.4	7.4	1,023	9.9	10.2
DEK-MW-15003	5/3/2021	1.88	13.0	8.0	340	14.9	4.6
DEK-MW-15004	5/3/2021	0.20	-174.6	7.5	362	14.8	7.8
DEK-MW-15005	5/3/2021	0.07	-199.7	7.6	629	10.6	3.7
DEK-MW-15006	5/3/2021	0.09	-152.6	7.5	1,140	10.7	5.3
DEK-MW-18001	5/3/2021	1.72	-64.3	7.3	558	10.6	2.4

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-226/228	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.
 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 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
 DE Karn Bottom Ash Pond – RCRA CCR Monitoring Program
 Essexville, Michigan

Constituent	Unit	EPA MCL	MI Residential*	MI Non-Residential*	MI GSI [^]	Sample Location: DEK-MW-15002	DEK-MW-15003	DEK-MW-15004	DEK-MW-15005	DEK-MW-15006	DEK-MW-18001
						Sample Date: 5/3/2021	5/3/2021	5/3/2021	5/3/2021	5/3/2021	5/3/2021
						downgradient	upgradient	sidegradient	downgradient	downgradient	downgradient
Appendix III⁽¹⁾											
Boron	ug/L	NC	500	500	4,000	1,420	862	914	926	938	1,180
Calcium	mg/L	NC	NC	NC	500 ^{EE}	148	27.4	60.2	95.6	115	65.2
Chloride	mg/L	250**	250 ^E	250 ^E	50	148	50.6	68	65.2	63.5	51.6
Fluoride	ug/L	4,000	NC	NC	NC	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	250**	250^E	250^E	500 ^{EE}	216	32.5	143	50.8	324	121
Total Dissolved Solids	mg/L	500**	500^E	500^E	500	926	246	493	534	790	486
pH, Field	SU	6.5 - 8.5**	6.5 - 8.5^E	6.5 - 8.5^E	6.5 - 9.0	7.4	8.0	7.5	7.6	7.5	7.3
Appendix IV⁽¹⁾											
Antimony	ug/L	6	6	6	2	< 1	< 1	1	< 1	< 1	< 1
Arsenic	ug/L	10	10	10	10	2	545	194	45	24	92
Barium	ug/L	2,000	2,000	2,000	1,200	211	42	104	173	139	135
Beryllium	ug/L	4	4	4	33	< 1	< 1	< 1	< 1	< 1	< 1
Cadmium	ug/L	5	5	5	2.5	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium	ug/L	100	100	100	11	< 1	< 1	< 1	< 1	< 1	< 1
Cobalt	ug/L	NC	40	100	100	< 6	< 6	< 6	< 6	< 6	< 6
Fluoride	ug/L	4,000	NC	NC	NC	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	4	4	14	< 1	< 1	< 1	< 1	< 1	< 1
Lithium	ug/L	NC	170	350	440	36	20	34	38	21	25
Mercury	ug/L	2	2	2	0.20 [#]	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Molybdenum	ug/L	NC	73	210	120	< 5	25	11	8	9	< 5
Radium-226/228	pCi/L	5	NC	NC	NC	0.811	< 0.548	0.856	0.722	1.16	0.828
Selenium	ug/L	50	50	50	5	< 1	1	< 1	1	< 1	< 1
Thallium	ug/L	2	2	2	2	< 2	< 2	< 2	< 2	< 2	< 2
Additional MI Part 115⁽²⁾											
Iron	ug/L	300**	300^E	300^E	500,000 ^{EE}	2,800	141	1,980	421	1,560	761
Copper	ug/L	1,000**	1,000 ^E	1,000 ^E	20	< 1	< 1	< 1	1	< 1	< 1
Nickel	ug/L	NC	100	100	120	2	< 2	< 2	3	7	< 2
Silver	ug/L	100**	34	98	0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Vanadium	ug/L	NC	4.5	62	27	< 2	< 2	< 2	< 2	< 2	< 2
Zinc	ug/L	5,000**	2,400	5,000 ^E	260	< 10	< 10	< 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 EGLE policy and procedure 09-014 dated June 20, 2012.

^E - Criterion is the aesthetic drinking water value per footnote (E).

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(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
 DE Karn Bottom Ash Pond – RCRA CCR Monitoring Program
 Essexville, Michigan

Constituent	Units	GWPS	DEW-MW-15002		DEK-MW-15005		DEK-MW-15006		DEK-MW-18001	
			LCL	UCL	LCL	UCL	LCL	UCL	LCL	UCL
Arsenic	ug/L	21	1.7	48	24	120	20	27	57	158

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 ($\alpha = 0.01$) of the downgradient data set.

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

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

Figures

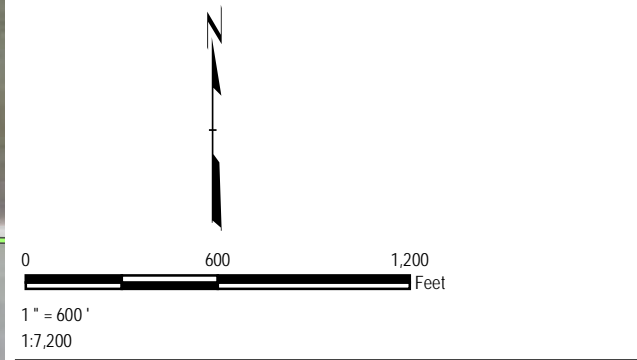
Plot Date: 4/26/2021, 14:19:45 PM by ADAIR -- LAYOUT: ANS1B(11"x17")
 Path: S:\1-PROJECTS\Consumers Energy Company\Michigan\CCR_GW2017_269767\11_DEKARN2021_MXD\2021_001_MARCH\418425-101-002.mxd
 Coordinate System: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl (Foot)
 Map Rotation: 0
 TRC - GIS




LEGEND

- DEK BOTTOM ASH POND & LINED IMPOUNDMENT MONITORING WELL
- DEK BOTTOM ASH POND MONITORING WELL
- DEK LINED IMPOUNDMENT MONITORING WELL
- DECOMMISSIONED MONITORING WELL
- SURFACE WATER GAUGING STATION
- NATURE AND EXTENT WELL
- SECONDARY CONTAINMENT SUMP (KLI-SCS)
- PRIMARY CONTAINMENT SYSTEM SAMPLE (KLI-PCS)
- SURFACE WATER SAMPLE (SW-DITCH)
- SLURRY WALL (APPROXIMATE)
- LINED IMPOUNDMENT (COVENANT BOUNDARY)

- ### NOTES
- BASE MAP IMAGERY FROM GOOGLE EARTH PRO, 2018.
 - WELL LOCATIONS SURVEYED BY ROWE PROFESSIONAL SERVICES COMPANY ON 11/4/2015.
 - NOAA/NATIONAL OCEANIC SERVICE GREAT LAKES GAUGING STATION, ESSEXVILLE, MI (ID: 9075035).
 - A SINGLE WELL SYMBOL IS SHOWN FOR WELL PAIRS MW-01/MW-02, MW-03/MW-04, OW-02/MW-22, AND OW-07/MW-23 AS THE WELLS ARE LOCATED WITHIN 15-FT OF EACH OTHER.



PROJECT:		CONSUMERS ENERGY COMPANY DE KARN AND JC WEADOCK POWER PLANTS ESSEXVILLE, MICHIGAN	
TITLE:		SITE LAYOUT MAP	
DRAWN BY:	A. ADAIR	PROJ NO.:	418425.0001
CHECKED BY:	J. KRENZ	FIGURE 2	
APPROVED BY:	L. DARBY		
DATE:	APRIL 2021		



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FILE NO.: 418425-101-002.mxd


Plot Date: 7/28/2021, 12:48:26 PM by ADAIR -- LAYOUT: ANS1B(11"x17")
 Path: S:\PROJECTS\Consumers Energy Company\Michigan\CCR_GW\2017_26976\1 DEKARN\2021_MXD\2021_002_MAY1418425-201-012.mxd
 Coordinate System: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl (Foot)
 Map Rotation: 0
 TRC - GIS

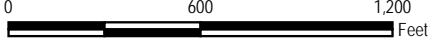


LEGEND

- DEK BOTTOM ASH POND & LINED IMPOUNDMENT MONITORING WELL
- DEK BOTTOM ASH POND MONITORING WELL
- DEK LINED IMPOUNDMENT MONITORING WELL
- DECOMMISSIONED MONITORING WELL
- MONITORING WELL (STATIC ONLY)
- SURFACE WATER GAUGING STATION
- NATURE AND EXTENT WELL
- SLURRY WALL (APPROXIMATE)
- LINED IMPOUNDMENT (COVENANT BOUNDARY)
- GROUNDWATER ELEVATION CONTOUR (1' INTERVAL, DASHED WHERE INFERRED)
- (580.50) GROUNDWATER ELEVATION (FEET)

- ### NOTES
1. BASE MAP IMAGERY FROM GOOGLE EARTH PRO, 2018.
 2. WELL LOCATIONS SURVEYED BY ROWE PROFESSIONAL SERVICES COMPANY ON 11/4/2015.
 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.





 1" = 600'
 1:7,200

PROJECT:		CONSUMERS ENERGY COMPANY DE KARN POWER PLANT ESSEXVILLE, MICHIGAN	
TITLE:		SHALLOW GROUNDWATER CONTOUR MAP MAY 3, 2021	
DRAWN BY:	A. ADAIR	PROJ NO.:	418425.0001
CHECKED BY:	J. KRENZ	FIGURE 3	
APPROVED BY:	L. DARBY		
DATE:	JULY 2021		



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FILE NO.: 418425-201-012.mxd

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 DE Karn Bottom Ash Pond and Lined Impoundment

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 in Jackson, Michigan. The laboratory analytical results were reported in laboratory sample delivery group (SDG) 21-0529.

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

- DEK-MW-15003
- DEK-MW-18001

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

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

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, where applicable. Method blanks are used to assess potential contamination arising from laboratory sample preparation and/or analytical procedures. Field and equipment blanks are used to assess potential contamination arising from field procedures;
- Data for laboratory control samples (LCSs) and laboratory control sample duplicates (LCSDs), when performed. The LCSs and/or LCSDs are used to assess the accuracy of the analytical method using a clean matrix;

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

It should be noted that results for method blanks and LCSs were not provided for review by CE Laboratory Services. Therefore, potential contamination arising from laboratory sample preparation and/or analytical procedures and the accuracy of the analytical method using a clean matrix could not be evaluated for the 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, IV, optional Piper Diagram analyses, and additional Part 115 constituents will be utilized for the purposes of a detection or assessment monitoring program.
- Data are usable for the purposes of the detection or assessment monitoring program.
- When the data are evaluated through a detection or assessment monitoring statistical program, findings below may be used to support the removal of outliers.

QA/QC Sample Summary

- A field blank was not collected with this data set.
- An equipment blank was not collected with this data set.
- MS and MSD analyses were performed on sample DEK-MW-18001 for total metals, anions, and alkalinity. The recoveries were within the acceptance limits. Relative percent differences (RPDs) were not provided by the laboratory and therefore were not evaluated; further, MS/MSD concentrations were not provided by the laboratory. However, since all recoveries were within the acceptance limits, there is no impact on data usability due to this issue.
- A field duplicate pair was not collected with this data set.
- Laboratory duplicate analyses were not performed on a sample from this data set.

Laboratory Data Quality Review Groundwater Monitoring Event May 2021 DE Karn Bottom Ash Pond

Groundwater samples were collected by TRC for the May 2021 sampling event. Samples were analyzed for total and dissolved metals, anions, total dissolved solids, and alkalinity by Consumers Energy (CE) Laboratory Services in Jackson, Michigan. The laboratory analytical results were reported in laboratory sample delivery group (SDG) 21-0528.

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

- DEK-MW-15002
- DEK-MW-15004
- DEK-MW-15005
- DEK-MW-15006

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

Analyte Group	Method
Anions (Fluoride, Chloride, Sulfate)	EPA 300.0
Total Dissolved Solids (TDS)	SM 2540C
Total and Dissolved Metals	SW-846 6020B/7470A
Alkalinity (Bicarbonate, Carbonate, and Total)	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, where applicable. Method blanks are used to assess potential contamination arising from laboratory sample preparation and/or analytical procedures. Field and equipment blanks are used to assess potential contamination arising from field procedures;
- Data for laboratory control samples (LCSs) and laboratory control sample duplicates (LCSDs), when performed. The LCSs and/or LCSDs are used to assess the accuracy of the analytical method using a clean matrix;

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

It should be noted that results for method blanks and LCSs were not provided for review by CE Laboratory Services. Therefore, potential contamination arising from laboratory sample preparation and/or analytical procedures and the accuracy of the analytical method using a clean matrix could not be evaluated for the 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 the detection 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-DEK-BAP) was collected. Total metals were not detected in the field blank sample with the exception of copper (1 ug/L). The copper detected in sample DEK-MW-15005 is potentially a false positive result due to field blank contamination, as summarized in the attached table, attachment 1.
- 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-DEK-BAP with DEK-MW-15005; relative percent differences (RPDs) between the parent and duplicate sample were within the QC limits.
- Laboratory duplicate analyses were not performed on a sample from this data set.

Attachment 1

Summary of Data Non-Conformances for Groundwater Analytical Data
DE Karn Bottom Ash Pond – RCRA CCR Monitoring Program
Erie, Michigan

Samples	Collection Date	Analyte	Non-Conformance/Issue
DEK-MW-15005	5/3/2021	Copper	Field blank contamination; indicates potential false positive copper result.

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 DE Karn Bottom Ash Pond/Lined Impoundment

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) 240-149195-1.

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

- DEK-MW-15003
- DEK-MW-18001

Each sample was analyzed for the following constituents:

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

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

Data Usability Review Procedure

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

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

- Percent recoveries for carriers for radiochemistry only. 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 analyses 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.
- An equipment blank was not collected in this data set.
- A field blank was not collected in this data set.
- The LCS and LCSD recoveries and relative percent differences (RPDs) were within QC limits.
- MS and MSD analyses were not performed on a sample from this data set.
- A field duplicate pair was not collected in this data set.
- Laboratory duplicate analyses were not performed on a sample from this data set.
- Carrier recoveries, where applicable, were within 40-110%.

Laboratory Data Quality Review Groundwater Monitoring Event May 2021 CEC DE Karn 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) 240-149197-1 (revision 1, dated 7/16/21).

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

- DEK-MW-15002 ■ DEK-MW-15004 ■ DEK-MW-15005
- DEK-MW-15006

Each sample was analyzed for the following constituents:

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

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

Data Usability Review Procedure

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

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

- Data for laboratory duplicates, when performed on project samples. The laboratory duplicates are replicate analyses of one sample and are used to assess the precision of the analytical method;
- Percent recoveries for carriers for radiochemistry only. 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 analyses 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.
- An equipment blank was not collected in this data set.
- A field blank was not collected in this data set.
- The LCS and LCSD recoveries and relative percent differences (RPDs) 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-DEK-BAP and DEK-MW-15005; RPDs between the parent and duplicate sample were within the QC limits.
- Laboratory duplicate analyses were not performed on a sample from this data set.
- Carrier recoveries, where applicable, were within 40-110%.

Appendix B
Statistical Evaluation of May 2021 Assessment
Monitoring Sampling Event

Technical Memorandum

Date: July 27, 2021

To: J.R. Register, Consumers Energy

From: Darby Litz, TRC
Katy Reminga, TRC

Project No.: 418425.0001.0000 Phase 002, Task 002

Subject: Statistical Evaluation of May 2021 Assessment Monitoring Sampling Event
DE Karn Bottom Ash Pond, Consumers Energy Company, Essexville, Michigan

During the statistical evaluation of the initial assessment monitoring event (May 2018), arsenic was 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 DE Karn Power Plant Bottom Ash Pond (Karn Bottom Ash Pond).

An assessment monitoring event was conducted on May 3 through May 7, 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 statistical evaluation of the assessment monitoring event data indicate the following constituent is present at statistically significant levels exceeding the GWPS in downgradient monitoring wells at the Karn Bottom Ash Pond:

Constituent	GWPS	#Downgradient Wells Observed
Arsenic	21 ug/L	2 of 4

The results of the assessment monitoring statistical evaluation for the downgradient wells are consistent with the results of the previous assessment monitoring data statistical evaluations, indicating that arsenic is the only constituent present at concentrations above the GWPS. Consumers Energy will continue to evaluate corrective measures per §257.96 and §257.97. Consumers Energy will continue

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).

Technical Memorandum

executing the self-implementing groundwater compliance schedule in conformance with §257.90 - §257.98.

Assessment Monitoring Statistical Evaluation

When the initial assessment monitoring event was completed in May 2018, the compliance well network at the Karn Bottom Ash Pond included six wells encircling the unit (DEK-MW-15002 through DEK-MW-15006 and DEK-MW-18001). Starting with this May 2021 statistical evaluation, the compliance well network includes DEK-MW-15002, DEK-MW-15005, DEK-MW-15006, and DEK-MW-18001. Due to changes in groundwater flow direction on site, monitoring wells DEK-MW-15003 and DEK-MW-15004 are no longer located downgradient of the unit and were determined to be no longer indicative of groundwater conditions influenced by the Karn Bottom Ash Pond. Therefore, monitoring wells DEK-MW-15003 and DEK-MW-15004 are no longer included for statistical analysis.

Following the assessment monitoring sampling event, compliance well data for the DEK BAP 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 Guidance², 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 exceedance of the GWPS within the past eight sampling events (April 2018 through May 2021) were retained for further analysis. Arsenic in each of the downgradient monitoring wells at the Karn Bottom

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

Technical Memorandum

Ash Pond had individual results exceeding the GWPS. Lead was detected in DEK-MW-15006 during May 2018 at a concentration of 320 ug/L, which exceeds its GWPS. However, this is the only detection of lead in the Bottom Ash Pond wells during either baseline sampling or assessment monitoring. Sampling conducted in November 2018 did not confirm the lead detection. Therefore, the single detection was classified as an outlier per the Double Quantification Rule as outlined in the Stats Plan and the Unified Guidance. As a result, only arsenic was retained for evaluation in all downgradient monitoring wells.

Groundwater data were then evaluated utilizing Sanitas™ statistical software. Sanitas™ is a software tool that is commercially available for performing statistical evaluation consistent with procedures outlined in the Unified Guidance. Within the Sanitas™ statistical program, confidence limits were selected to perform the statistical comparison of compliance data to a fixed standard. Parametric and non-parametric confidence intervals were calculated for each of the CCR Appendix IV constituents using a using a per test³ 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 baseline results (December 2015 through August 2017) and the assessment monitoring results (April 2018 through May 2021) were visually assessed for potential trends. No outliers were identified. Arsenic concentrations at DEK-MW-15002 and DEK-MW-18001 appear to exhibit a downward trend on the time-series chart (Attachment 1). These two 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 showed that arsenic concentrations at DEK-MW-15002 and DEK-MW-18001 are generally decreasing with time, as evidenced by the negative Sen's Slope. Additionally, the decrease in concentrations at DEK-MW-15002 was shown to be statistically significant and arsenic concentrations have been below the GWPS for the 5 most recent sampling events (Attachment 1). The decreases in arsenic concentrations at

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

Technical Memorandum

DEK-MW-15002 and DEK-MW-18001 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. Arsenic concentrations have already triggered assessment monitoring (e.g., not a newly identified GWPS exceedance) and an interim measure has been initiated through the removal of CCR from the bottom ash pond in 2019; therefore, traditional confidence interval calculations are presented in this statistical evaluation until more post-CCR removal data are available. If trends continued to be observed as additional post-CCR removal data are collected, 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, and as of the May 2021 event, 7 semi-annual sampling events have been completed post-CCR removal.

The Sanitas™ software was 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 UG 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 for well/constituent pairs with a direct GWPS exceedance 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 graph for the confidence intervals of each well. The arsenic data set at DEK-MW-15006 was found to be normally distributed, DEK-MW-15005 used a non-parametric confidence interval due to non-normal data set, DEK-MW-15002 was normalized using a square root transformation, and DEK-MW-18001 was normalized using a logarithmic transformation. The confidence interval test compares the lower confidence limit to the GWPS. The statistical evaluation of the Appendix IV parameters shows exceedances for arsenic at two of the four monitoring locations (DEK-MW-15005 and DEK-MW-18001). The results of the assessment monitoring statistical evaluation for the other downgradient wells are consistent with the results of the previous assessment monitoring data statistical evaluations, indicating that arsenic is the only constituent present at concentrations above the GWPS. 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 – April 2018 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
 DE Karn Bottom Ash Pond – RCRA CCR Monitoring Program
 Essexville, Michigan

		Sample Location:				DEK-MW-15002									
		Sample Date:				4/12/2018	5/23/2018	11/5/2018	4/11/2019	10/15/2019	5/13/2020	10/6/2020	10/6/2020	5/3/2021	
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS	downgradient									
Appendix III															
Boron	ug/L	NC	NA	619	NA	--	967	894	860	1,600	1,390	1,580	1,600	1,420	
Calcium	mg/L	NC	NA	302	NA	--	53.7	67.8	72	130	170	126	122	148	
Chloride	mg/L	250*	NA	2,440	NA	--	79.7	83.5	80	410	130	106	102	148	
Fluoride	ug/L	4,000	NA	1,000	NA	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	1,300	< 1,000	< 1,000	
Sulfate	mg/L	250*	NA	407	NA	--	263	77.2	45	150	367	142	139	216	
Total Dissolved Solids	mg/L	500*	NA	4,600	NA	--	660	536	560	1,300	1,100	791	776	926	
pH, Field	SU	6.5 - 8.5*	NA	6.5 - 7.3	NA	7.5	8.0	7.3	7.5	7.3	7.1	7.1	--	7.4	
Appendix IV															
Antimony	ug/L	6	NA	1	6	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1	< 1	
Arsenic	ug/L	10	NA	21	21	56.4	67.0	31.7	9.0	6.5	3	8	8	2	
Barium	ug/L	2,000	NA	1,300	2,000	82.7	84.5	71.6	71	140	196	133	131	211	
Beryllium	ug/L	4	NA	1	4	< 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	< 0.2	< 0.2	< 0.2	< 0.2	
Chromium	ug/L	100	NA	3	100	< 1.0	< 1.0	1.4	1.3	< 1.0	< 1	1	1	< 1	
Cobalt	ug/L	NC	6	15	15	< 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	1,300	< 1,000	< 1,000	
Lead	ug/L	NC	15	1	15	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1	< 1	
Lithium	ug/L	NC	40	180	180	43	35	32	26	35	48	35	36	36	
Mercury	ug/L	2	NA	0.2	2	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.2	< 0.2	< 0.2	< 0.2	
Molybdenum	ug/L	NC	100	6	100	30.8	35.4	< 5.0	< 5.0	< 5.0	< 5	< 5	< 5	< 5	
Radium-226	pCi/L	NC	NA	NA	NA	< 0.478	< 0.698	< 0.850	< 0.376	0.334	0.673	< 0.430	< 0.577	0.582	
Radium-228	pCi/L	NC	NA	NA	NA	1.16	< 0.744	0.730	0.684	0.654	< 0.763	0.642	< 0.460	< 0.537	
Radium-226/228	pCi/L	5	NA	3.32	5	1.42	< 1.44	< 1.39	0.846	0.987	0.899	1.06	< 0.577	0.811	
Selenium	ug/L	50	NA	2	50	< 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	< 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) Outlier; single detection above reporting limit.

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

Sample Location:						DEK-MW-15005												
Sample Date:						4/11/2018	4/11/2018	5/24/2018	11/6/2018	4/11/2019	4/11/2019	10/15/2019	10/15/2019	5/13/2020	5/13/2020	10/7/2020	5/3/2021	5/3/2021
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS	downgradient												
Appendix III							Field Dup				Field Dup		Field Dup		Field Dup			Field Dup
Boron	ug/L	NC	NA	619	NA	--	--	806	947	910	910	700	650	863	858	847	926	948
Calcium	mg/L	NC	NA	302	NA	--	--	33.4	32.9	31	31	60	59	71.0	72.1	155.0	95.6	97.6
Chloride	mg/L	250*	NA	2,440	NA	--	--	72.6	69.1	60	60	64	64	48.0	47.5	52.7	65.2	65.1
Fluoride	ug/L	4,000	NA	1,000	NA	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	250*	NA	407	NA	--	--	182	160	140	140	5.2	5.0	18.9	18.9	102	50.8	50.2
Total Dissolved Solids	mg/L	500*	NA	4,600	NA	--	--	524	474	470	470	390	400	419	425	687	534	561
pH, Field	SU	6.5 - 8.5*	NA	6.5 - 7.3	NA	7.7	--	7.8	7.9	7.7	--	7.6	--	8.1	--	7.7	7.6	--
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	< 1
Arsenic	ug/L	10	NA	21	21	28.3	29.1	31.7	35.0	24	24	120	120	34	34	42	45	44
Barium	ug/L	2,000	NA	1,300	2,000	54.9	55.8	58.5	56.7	46	45	110	100	127	127	248	173	170
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	< 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	< 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	< 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	< 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	< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	15	1	15	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1	< 1	< 1
Lithium	ug/L	NC	40	180	180	24	24	19	17	15	14	16	15	20	20	45	38	39
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	< 0.2
Molybdenum	ug/L	NC	100	6	100	39.0	40.5	41.9	45.3	39	38	< 5.0	< 5.0	< 5	< 5	< 5	8	8
Radium-226	pCi/L	NC	NA	NA	NA	< 0.587	0.606	< 0.740	< 0.865	< 0.379	< 0.406	0.165	0.185	< 0.469	< 0.335	0.621	0.291	< 0.187
Radium-228	pCi/L	NC	NA	NA	NA	0.756	0.886	0.857	< 0.598	< 0.754	< 0.586	< 0.456	0.497	1.14	< 0.554	< 0.502	< 0.459	0.479
Radium-226/228	pCi/L	5	NA	3.32	5	< 1.34	1.49	< 1.53	< 1.46	< 0.754	< 0.586	0.524	0.682	1.34	0.662	0.875	0.722	0.65
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	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	< 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) Outlier; single detection above reporting limit.

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

Sample Location:						DEK-MW-15006								
Sample Date:						4/11/2018	5/24/2018	11/5/2018	11/5/2018	4/11/2019	10/14/2019	5/13/2020	10/7/2020	5/3/2021
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS	downgradient								
Appendix III									Field Dup					
Boron	ug/L	NC	NA	619	NA	--	1,200	1,340	1,270	1,700	1,200	1,090	1,220	938
Calcium	mg/L	NC	NA	302	NA	--	21.9	29.4	29.6	35	34	70.4	106	115
Chloride	mg/L	250*	NA	2,440	NA	--	85.8	87.9	88.3	75	45	71.5	102	63.5
Fluoride	ug/L	4,000	NA	1,000	NA	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	1,060	< 1,000
Sulfate	mg/L	250*	NA	407	NA	--	401	341	344	320	74	316	296	324
Total Dissolved Solids	mg/L	500*	NA	4,600	NA	--	944	792	784	780	450	833	1,010	790
pH, Field	SU	6.5 - 8.5*	NA	6.5 - 7.3	NA	7.9	8.2	7.9	--	7.8	7.8	8.1	7.7	7.5
Appendix IV														
Antimony	ug/L	6	NA	1	6	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	3	< 1	< 1
Arsenic	ug/L	10	NA	21	21	18.3	25.7	20.9	19.6	21	27	21	27	24
Barium	ug/L	2,000	NA	1,300	2,000	39.6	22.8	38.5	38.3	43	51	86	141	139
Beryllium	ug/L	4	NA	1	4	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1
Cadmium	ug/L	5	NA	0.2	5	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.2	< 0.2	< 0.2
Chromium	ug/L	100	NA	3	100	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	1.1	2	6	< 1
Cobalt	ug/L	NC	6	15	15	< 15.0	< 15.0	< 6.0	< 6.0	< 6.0	< 6.0	< 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	1,060	< 1,000
Lead	ug/L	NC	15	1	15	< 1.0	320 ⁽¹⁾	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1
Lithium	ug/L	NC	40	180	180	18	< 10	< 10	10	< 10	11	15	22	21
Mercury	ug/L	2	NA	0.2	2	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.2	< 0.2	< 0.2
Molybdenum	ug/L	NC	100	6	100	71.6	48.7	50.3	48.0	59	11	18	11	9
Radium-226	pCi/L	NC	NA	NA	NA	< 0.688	< 0.738	< 0.885	< 1.06	< 0.459	< 0.159	< 0.370	0.629	0.353
Radium-228	pCi/L	NC	NA	NA	NA	< 0.755	< 1.12	< 0.649	< 0.897	< 0.677	< 0.581	0.78	0.492	0.804
Radium-226/228	pCi/L	5	NA	3.32	5	< 1.44	< 1.86	< 1.53	< 1.96	< 0.677	< 0.581	1.01	1.12	1.16
Selenium	ug/L	50	NA	2	50	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1
Thallium	ug/L	2	NA	2	2	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2	< 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) Outlier; single detection above reporting limit.

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

Sample Location:						DEK-MW-18001						
Sample Date:						5/23/2018	11/6/2018	4/10/2019	10/15/2019	5/14/2020	10/6/2020	5/3/2021
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS	downgradient						
Appendix III												
Boron	ug/L	NC	NA	619	NA	1,600	1,020	970	2,200	1,670	1,740	1,180
Calcium	mg/L	NC	NA	302	NA	64.9	51.1	48	84	72.1	71.7	65.2
Chloride	mg/L	250*	NA	2,440	NA	69.1	76.6	69	81	64.7	60.7	51.6
Fluoride	ug/L	4,000	NA	1,000	NA	< 1,000	1,300	1,200	1,000	1,090	1,240	< 1,000
Sulfate	mg/L	250*	NA	407	NA	30.6	< 2.0	< 2.0	31	51.1	91.9	121
Total Dissolved Solids	mg/L	500*	NA	4,600	NA	434	340	360	500	484	476	486
pH, Field	SU	6.5 - 8.5*	NA	6.5 - 7.3	NA	7.8	7.5	7.2	7.3	7.7	7.6	7.3
Appendix IV												
Antimony	ug/L	6	NA	1	6	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1
Arsenic	ug/L	10	NA	21	21	225	116	68	63	79	85	92
Barium	ug/L	2,000	NA	1,300	2,000	101	79.5	75	160	130	136	135
Beryllium	ug/L	4	NA	1	4	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1
Cadmium	ug/L	5	NA	0.2	5	< 0.20	< 0.20	< 0.20	< 0.20	< 0.2	< 0.2	< 0.2
Chromium	ug/L	100	NA	3	100	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1
Cobalt	ug/L	NC	6	15	15	< 15.0	< 6.0	< 6.0	< 6.0	< 6	< 6	< 6
Fluoride	ug/L	4,000	NA	1,000	4,000	< 1,000	1,300	1,200	1,000	1,090	1,240	< 1,000
Lead	ug/L	NC	15	1	15	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1
Lithium	ug/L	NC	40	180	180	23	24	24	36	27	26	25
Mercury	ug/L	2	NA	0.2	2	< 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	< 5.0	< 5.0	< 5	< 5	< 5
Radium-226	pCi/L	NC	NA	NA	NA	0.906	< 0.813	0.173	0.206	< 0.608	< 0.473	0.189
Radium-228	pCi/L	NC	NA	NA	NA	< 0.733	0.811	0.694	0.746	< 0.676	0.463	0.639
Radium-226/228	pCi/L	5	NA	3.32	5	1.63	1.56	0.867	0.952	< 0.676	0.591	0.828
Selenium	ug/L	50	NA	2	50	< 1.0	< 1.0	< 1.0	< 1.0	< 1	1	< 1
Thallium	ug/L	2	NA	2	2	< 2.0	< 2.0	< 2.0	< 2.0	< 2	< 2	< 2

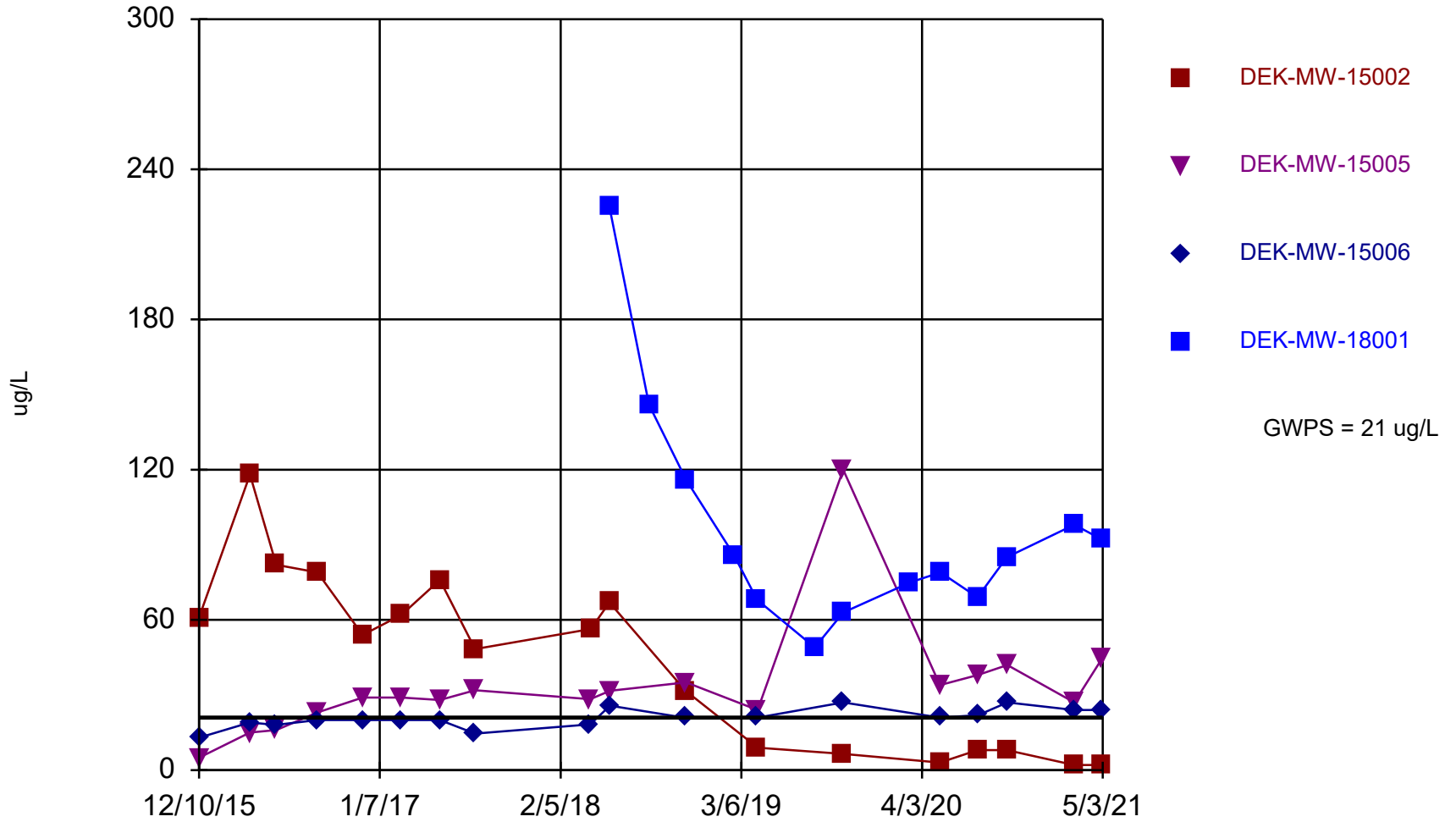
Notes:

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) Outlier; single detection above reporting limit.

Attachment 1

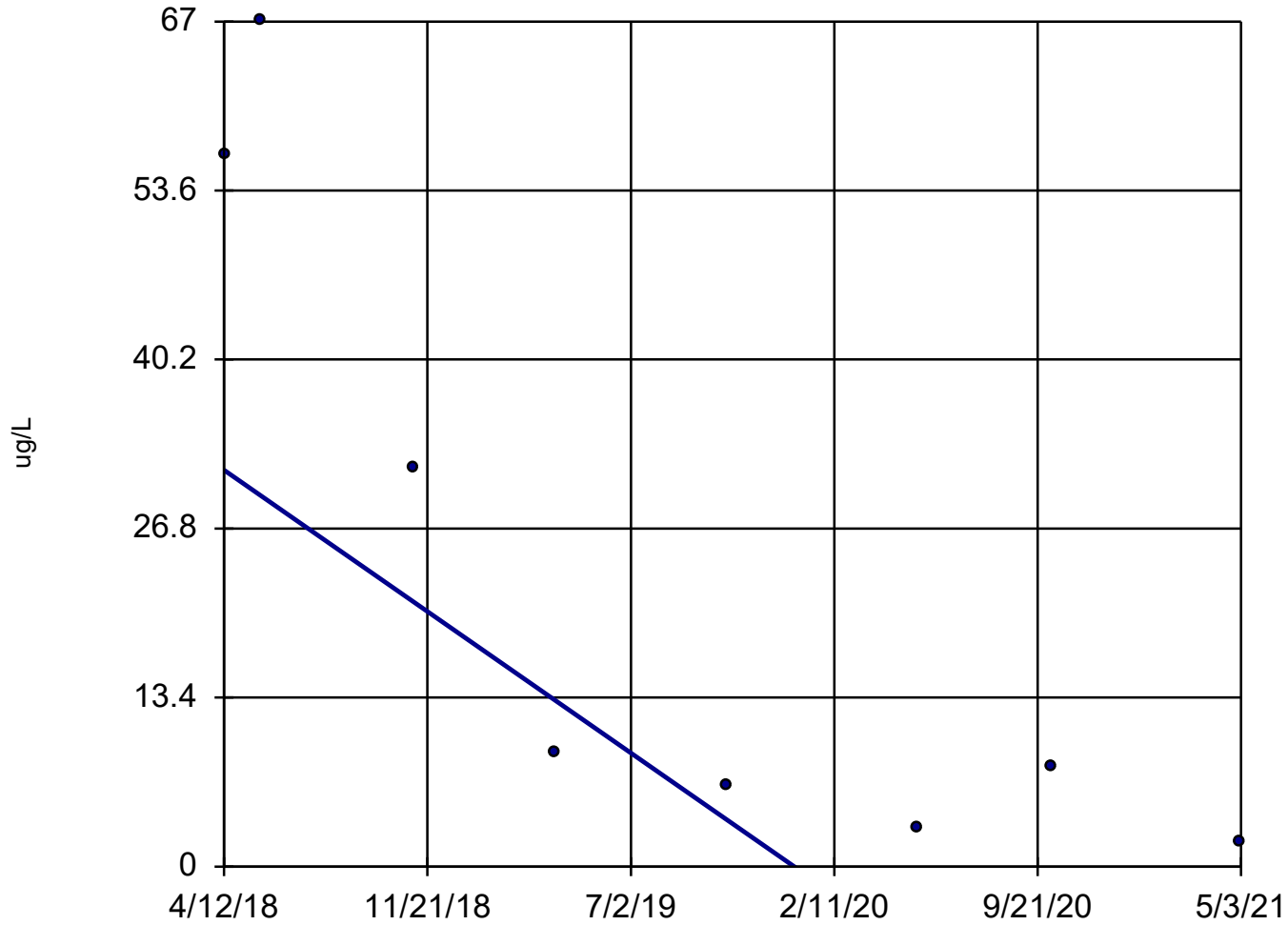
Sanitas™ Output Files

Arsenic, Total



Time Series Analysis Run 6/30/2021 8:38 AM
Client: Consumers Energy Data: DEK_HMPCCR_Sanitas_21Q2.rev1

Arsenic, Total DEK-MW-15002

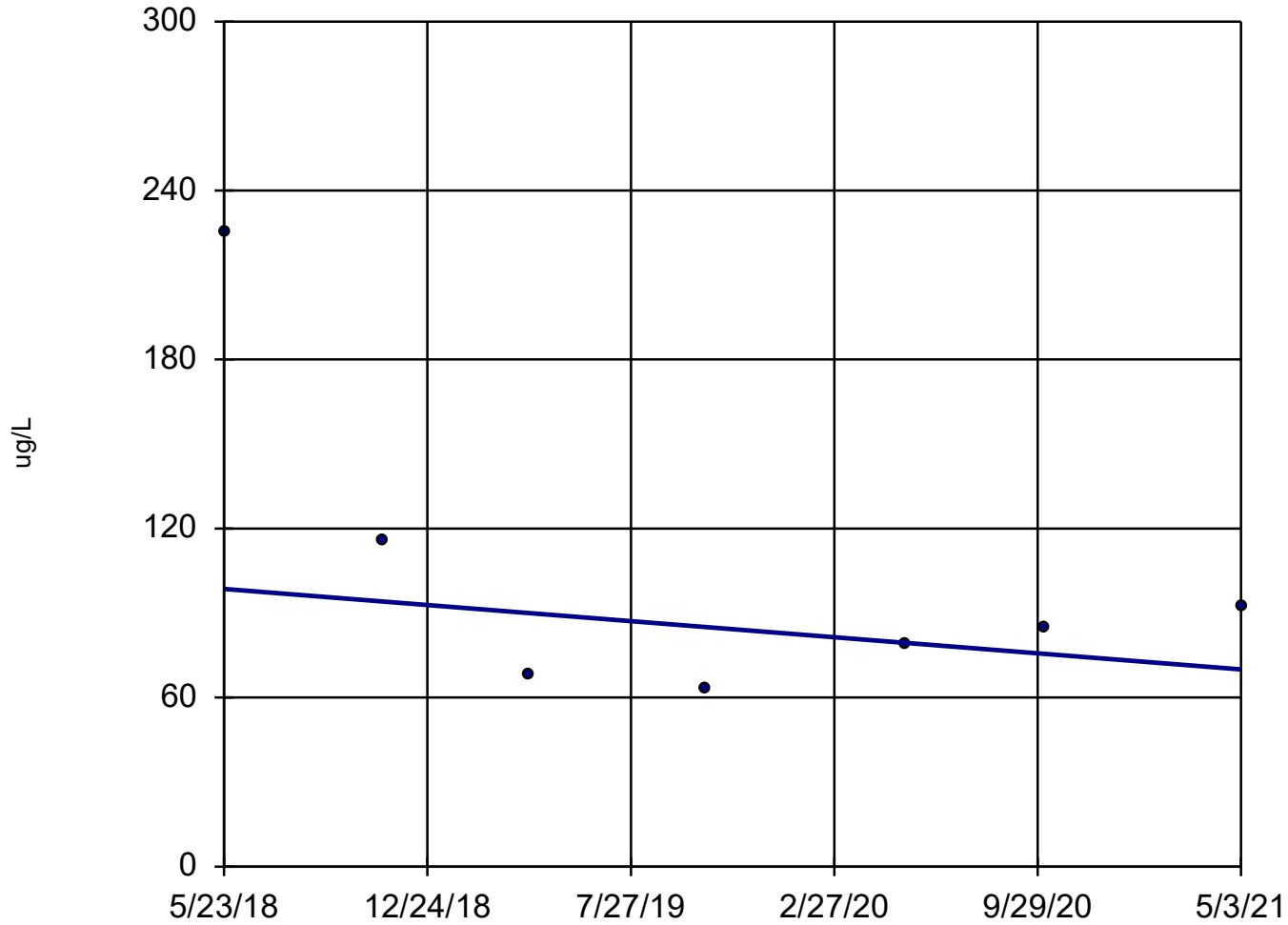


n = 8
Slope = -18.33
units per year.
Mann-Kendall
statistic = -22
critical = -20
Decreasing trend
significant at 98%
confidence level
($\alpha = 0.01$ per
tail).

Sen's Slope Estimator Analysis Run 6/21/2021 5:27 PM

Client: Consumers Energy Data: DEK_HMPCCR_Sanitas_21Q2 - Copy

Arsenic, Total DEK-MW-18001



n = 7
Slope = -9.707
units per year.
Mann-Kendall
statistic = -3
critical = -17
Trend not sig-
nificant at 98%
confidence level
($\alpha = 0.01$ per
tail).

Sen's Slope Estimator Analysis Run 6/21/2021 5:29 PM

Client: Consumers Energy Data: DEK_HMPCCR_Sanitas_21Q2 - Copy

Summary Report

Constituent: Arsenic, Total Analysis Run 6/21/2021 5:30 PM
Client: Consumers Energy Data: DEK_HMPCCR_Sanitas_21Q2 - Copy

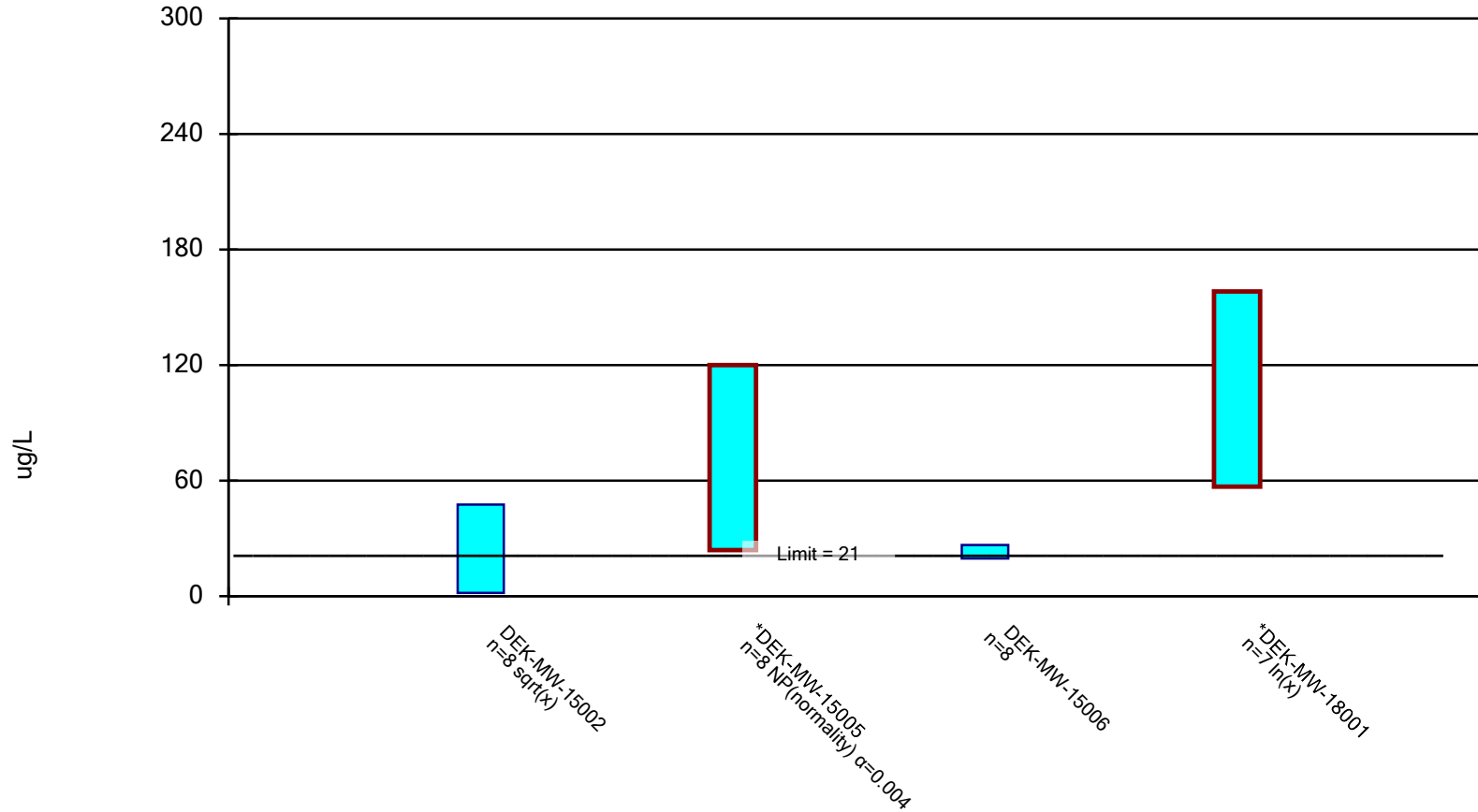
For observations made between 4/11/2018 and 5/3/2021, a summary of the selected data set:

Observations = 31
ND/Trace = 0
Wells = 4
Minimum Value = 2
Maximum Value = 225
Mean Value = 46.98
Median Value = 31.7
Standard Deviation = 45.59
Coefficient of Variation = 0.9703
Skewness = 2.167

<u>Well</u>	<u>#Obs.</u>	<u>ND/Trace</u>	<u>Min</u>	<u>Max</u>	<u>Mean</u>	<u>Median</u>	<u>Std.Dev.</u>	<u>CV</u>	<u>Skewness</u>
DEK-MW-15002	8	0	2	67	22.95	8.5	25.81	1.124	0.8525
DEK-MW-15005	8	0	24	120	45	34.5	31.06	0.6902	2.056
DEK-MW-15006	8	0	18.3	27	23.11	22.5	3.266	0.1413	-0.02463
DEK-MW-18001	7	0	63	225	104	85	56.11	0.5395	1.664

Parametric and Non-Parametric (NP) Confidence Interval

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



Constituent: Arsenic, Total Analysis Run 6/21/2021 5:31 PM

Client: Consumers Energy Data: DEK_HMPCCR_Sanitas_21Q2 - Copy

Confidence Interval

Constituent: Arsenic, Total (ug/L) Analysis Run 6/21/2021 5:31 PM

Client: Consumers Energy Data: DEK_HMPCCR_Sanitas_21Q2 - Copy

	DEK-MW-15002	DEK-MW-15005	DEK-MW-15006	DEK-MW-18001
4/11/2018		28.3	18.3	
4/12/2018	56.4			
5/23/2018	67			225
5/24/2018		31.7	25.7	
11/5/2018	31.7		20.9	
11/6/2018		35		116
4/10/2019				68
4/11/2019	9	24	21	
10/15/2019	6.5	120	27	63
5/13/2020	3	34	21	
5/14/2020				79
10/6/2020	8			85
10/7/2020		42	27	
5/3/2021	2	45	24	92
Mean	22.95	45	23.11	104
Std. Dev.	25.81	31.06	3.266	56.11
Upper Lim.	47.64	120	26.57	158.1
Lower Lim.	1.717	24	19.65	56.89

Appendix C

Groundwater Flow Evaluation

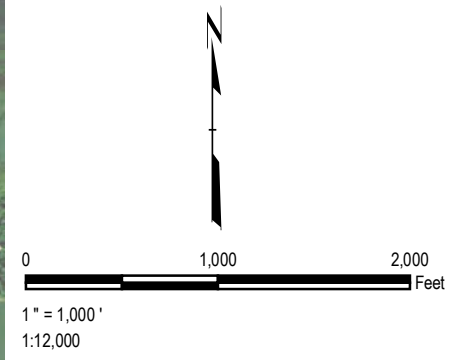


LEGEND

- BACKGROUND MONITORING WELL
- BEDROCK MONITORING WELL
- DEK BOTTOM ASH POND MONITORING WELL
- JCW BOTTOM ASH POND MONITORING WELL
- JCW LANDFILL MONITORING WELL
- SURFACE WATER GAUGING STATION
- SLURRY WALL (APPROXIMATE)
- GROUNDWATER ELEVATION CONTOUR (2' INTERVAL, DASHED WHERE INFERRED)
- GROUNDWATER ELEVATION (FEET, MSL)

NOTES

1. BASE MAP IMAGERY FROM USDA - NATIONAL AGRICULTURE IMAGERY PROGRAM, 7/10/2016.
2. WELL LOCATIONS SURVEYED BY ROWE PROFESSIONAL SERVICES COMPANY ON 11/4/2015.
3. NOAA/NATIONAL OCEANIC SERVICE GREAT LAKES GAUGING STATION, ESSEXVILLE, MI (ID: 9075035).



PROJECT:		CONSUMERS ENERGY COMPANY DE KARN AND JC WEADOCK POWER PLANTS ESSEXVILLE, MICHIGAN	
TITLE:		SHALLOW GROUNDWATER CONTOUR MAP DECEMBER 2015	
DRAWN BY:	J. PAPEZ	PROJ NO.:	269767-002/3
CHECKED BY:	D. LITZ	FIGURE 1	
APPROVED BY:	G. CROCKFORD		
DATE:	OCTOBER 2017		
		1540 Eisenhower Place Ann Arbor, MI 48108-3284 Phone: 734.971.7080 www.trcsolutions.com	
FILE NO.:	269767-002_3-001.mxd		

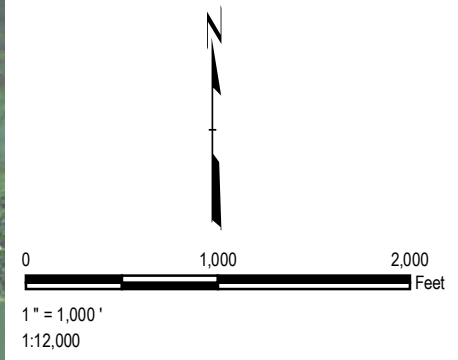


LEGEND

- BACKGROUND MONITORING WELL
- BEDROCK MONITORING WELL
- DEK BOTTOM ASH POND MONITORING WELL
- JCW BOTTOM ASH POND MONITORING WELL
- JCW LANDFILL MONITORING WELL
- SURFACE WATER GAUGING STATION
- SLURRY WALL (APPROXIMATE)
- GROUNDWATER ELEVATION CONTOUR (2' INTERVAL, DASHED WHERE INFERRED)
- GROUNDWATER ELEVATION (FEET, MSL)

NOTES

1. BASE MAP IMAGERY FROM USDA - NATIONAL AGRICULTURE IMAGERY PROGRAM, 7/10/2016.
2. WELL LOCATIONS SURVEYED BY ROWE PROFESSIONAL SERVICES COMPANY ON 11/4/2015.
3. NOAA/NATIONAL OCEANIC SERVICE GREAT LAKES GAUGING STATION, ESSEXVILLE, MI (ID: 9075035).



PROJECT:		CONSUMERS ENERGY COMPANY DE KARN AND JC WEADOCK POWER PLANTS ESSEXVILLE, MICHIGAN	
TITLE:		SHALLOW GROUNDWATER CONTOUR MAP MARCH 2016	
DRAWN BY:	J. PAPEZ	PROJ NO.:	269767-002/3
CHECKED BY:	D. LITZ	FIGURE 2	
APPROVED BY:	G. CROCKFORD		
DATE:	OCTOBER 2017		
		1540 Eisenhower Place Ann Arbor, MI 48108-3284 Phone: 734.971.7080 www.trcsolutions.com	
FILE NO.:	269767-002_3-002.mxd		



LEGEND

- BACKGROUND MONITORING WELL
- BEDROCK MONITORING WELL
- DEK BOTTOM ASH POND MONITORING WELL
- JCW BOTTOM ASH POND MONITORING WELL
- JCW LANDFILL MONITORING WELL
- SURFACE WATER GAUGING STATION
- SLURRY WALL (APPROXIMATE)
- GROUNDWATER ELEVATION CONTOUR (2' INTERVAL, DASHED WHERE INFERRED)
- (580.85) GROUNDWATER ELEVATION (FEET, MSL)

- NOTES**
1. BASE MAP IMAGERY FROM USDA - NATIONAL AGRICULTURE IMAGERY PROGRAM, 7/10/2016.
 2. WELL LOCATIONS SURVEYED BY ROWE PROFESSIONAL SERVICES COMPANY ON 11/4/2015.
 3. NOAA/NATIONAL OCEANIC SERVICE GREAT LAKES GAUGING STATION, ESSEXVILLE, MI (ID: 9075035).

1" = 1,000'
1:12,000

PROJECT:		CONSUMERS ENERGY COMPANY DE KARN AND JC WEADOCK POWER PLANTS ESSEXVILLE, MICHIGAN	
TITLE:		SHALLOW GROUNDWATER CONTOUR MAP MAY 2016	
DRAWN BY:	J. PAPEZ	PROJ NO.:	269767-002/3
CHECKED BY:	D. LITZ	FIGURE 3	
APPROVED BY:	G. CROCKFORD		
DATE:	OCTOBER 2017		
FILE NO.:		269767-002_3-003.mxd	

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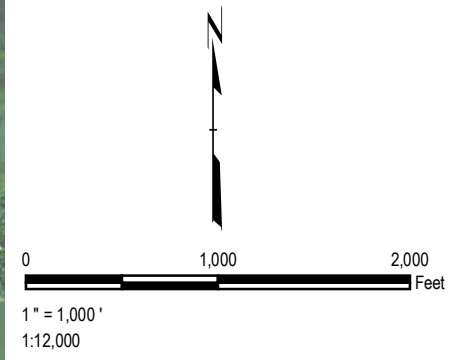


LEGEND

- BACKGROUND MONITORING WELL
- BEDROCK MONITORING WELL
- DEK BOTTOM ASH POND MONITORING WELL
- JCW BOTTOM ASH POND MONITORING WELL
- JCW LANDFILL MONITORING WELL
- SURFACE WATER GAUGING STATION
- SLURRY WALL (APPROXIMATE)
- GROUNDWATER ELEVATION CONTOUR (2' INTERVAL, DASHED WHERE INFERRED)
- GROUNDWATER ELEVATION (FEET, MSL)

NOTES

1. BASE MAP IMAGERY FROM USDA - NATIONAL AGRICULTURE IMAGERY PROGRAM, 7/10/2016.
2. WELL LOCATIONS SURVEYED BY ROWE PROFESSIONAL SERVICES COMPANY ON 11/4/2015.
3. NOAA/NATIONAL OCEANIC SERVICE GREAT LAKES GAUGING STATION, ESSEXVILLE, MI (ID: 9075035).



PROJECT:		CONSUMERS ENERGY COMPANY DE KARN AND JC WEADOCK POWER PLANTS ESSEXVILLE, MICHIGAN	
TITLE:		SHALLOW GROUNDWATER CONTOUR MAP AUGUST 2016	
DRAWN BY:	J. PAPEZ	PROJ NO.:	269767-002/3
CHECKED BY:	D. LITZ	FIGURE 4	
APPROVED BY:	G. CROCKFORD		
DATE:	OCTOBER 2017		
		1540 Eisenhower Place Ann Arbor, MI 48108-3284 Phone: 734.971.7080 www.trcsolutions.com	
FILE NO.:	269767-002_3-004.mxd		

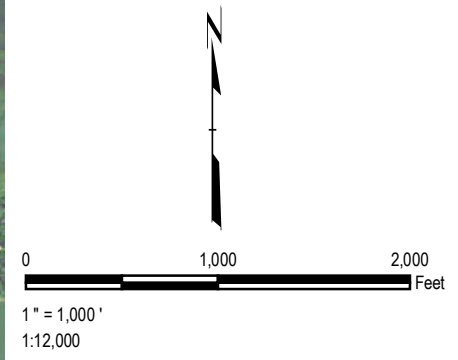


LEGEND

- BACKGROUND MONITORING WELL
- BEDROCK MONITORING WELL
- DEK BOTTOM ASH POND MONITORING WELL
- JCW BOTTOM ASH POND MONITORING WELL
- JCW LANDFILL MONITORING WELL
- SURFACE WATER GAUGING STATION
- SLURRY WALL (APPROXIMATE)
- GROUNDWATER ELEVATION CONTOUR (2' INTERVAL, DASHED WHERE INFERRED)
- GROUNDWATER ELEVATION (FEET, MSL)

NOTES

1. BASE MAP IMAGERY FROM USDA - NATIONAL AGRICULTURE IMAGERY PROGRAM, 7/10/2016.
2. WELL LOCATIONS SURVEYED BY ROWE PROFESSIONAL SERVICES COMPANY ON 11/4/2015.
3. NOAA/NATIONAL OCEANIC SERVICE GREAT LAKES GAUGING STATION, ESSEXVILLE, MI (ID: 9075035).



PROJECT:		CONSUMERS ENERGY COMPANY DE KARN AND JC WEADOCK POWER PLANTS ESSEXVILLE, MICHIGAN	
TITLE:		SHALLOW GROUNDWATER CONTOUR MAP NOVEMBER 2016	
DRAWN BY:	J. PAPEZ	PROJ NO.:	269767-002/3
CHECKED BY:	D. LITZ	FIGURE 5	
APPROVED BY:	G. CROCKFORD		
DATE:	OCTOBER 2017		
		1540 Eisenhower Place Ann Arbor, MI 48108-3284 Phone: 734.971.7080 www.trcsolutions.com	
FILE NO.:	269767-002_3-005.mxd		

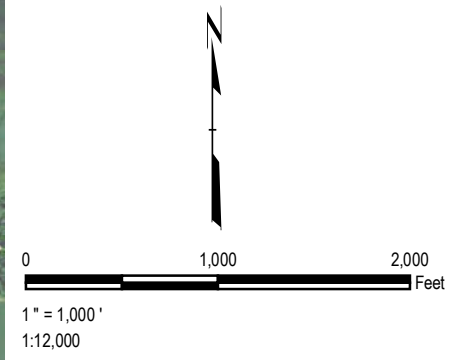


LEGEND

- BACKGROUND MONITORING WELL
- BEDROCK MONITORING WELL
- DEK BOTTOM ASH POND MONITORING WELL
- JCW BOTTOM ASH POND MONITORING WELL
- JCW LANDFILL MONITORING WELL
- SURFACE WATER GAUGING STATION
- SLURRY WALL (APPROXIMATE)
- GROUNDWATER ELEVATION CONTOUR (2' INTERVAL, DASHED WHERE INFERRED)
- GROUNDWATER ELEVATION (FEET, MSL)

NOTES

1. BASE MAP IMAGERY FROM USDA - NATIONAL AGRICULTURE IMAGERY PROGRAM, 7/10/2016.
2. WELL LOCATIONS SURVEYED BY ROWE PROFESSIONAL SERVICES COMPANY ON 11/4/2015.
3. NOAA/NATIONAL OCEANIC SERVICE GREAT LAKES GAUGING STATION, ESSEXVILLE, MI (ID: 9075035).



PROJECT:		CONSUMERS ENERGY COMPANY DE KARN AND JC WEADOCK POWER PLANTS ESSEXVILLE, MICHIGAN	
TITLE:		SHALLOW GROUNDWATER CONTOUR MAP FEBRUARY 2017	
DRAWN BY:	J. PAPEZ	PROJ NO.:	269767-002/3
CHECKED BY:	D. LITZ	FIGURE 6	
APPROVED BY:	G. CROCKFORD		
DATE:	OCTOBER 2017		
		1540 Eisenhower Place Ann Arbor, MI 48108-3284 Phone: 734.971.7080 www.trcsolutions.com	
FILE NO.:	269767-002_3-006.mxd		



LEGEND

- BACKGROUND MONITORING WELL
- BEDROCK MONITORING WELL
- DEK BOTTOM ASH POND MONITORING WELL
- JCW BOTTOM ASH POND MONITORING WELL
- JCW LANDFILL MONITORING WELL
- SURFACE WATER GAUGING STATION
- SLURRY WALL (APPROXIMATE)
- GROUNDWATER ELEVATION CONTOUR (2' INTERVAL, DASHED WHERE INFERRED)
- GROUNDWATER ELEVATION (FEET, MSL)

- NOTES**
1. BASE MAP IMAGERY FROM USDA - NATIONAL AGRICULTURE IMAGERY PROGRAM, 7/10/2016.
 2. WELL LOCATIONS SURVEYED BY ROWE PROFESSIONAL SERVICES COMPANY ON 11/4/2015.
 3. NOAA/NATIONAL OCEANIC SERVICE GREAT LAKES GAUGING STATION, ESSEXVILLE, MI (ID: 9075035).

0 1,000 2,000 Feet

1" = 1,000'

1:12,000

PROJECT:

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

TITLE:

**SHALLOW GROUNDWATER CONTOUR MAP
MAY 2017**

DRAWN BY: J. PAPEZ PROJ NO.: 269767-002/3

CHECKED BY: D. LITZ

APPROVED BY: G. CROCKFORD

DATE: OCTOBER 2017

FIGURE 7

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FILE NO.: 269767-002_3-009.mxd



LEGEND

- BACKGROUND MONITORING WELL
- BEDROCK MONITORING WELL
- DEK BOTTOM ASH POND MONITORING WELL
- JCW BOTTOM ASH POND MONITORING WELL
- JCW LANDFILL MONITORING WELL
- SURFACE WATER GAUGING STATION
- SLURRY WALL (APPROXIMATE)
- GROUNDWATER ELEVATION CONTOUR (2' INTERVAL, DASHED WHERE INFERRED)
- GROUNDWATER ELEVATION (FEET, MSL)

- NOTES**
- BASE MAP IMAGERY FROM USDA – NATIONAL AGRICULTURE IMAGERY PROGRAM, 7/10/2016.
 - WELL LOCATIONS SURVEYED BY ROWE PROFESSIONAL SERVICES COMPANY ON 11/4/2015.
 - NOAA/NATIONAL OCEANIC SERVICE GREAT LAKES GAUGING STATION, ESSEXVILLE, MI (ID: 9075035).

0 1,000 2,000 Feet

1" = 1,000'

1:12,000

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

TITLE: **SHALLOW GROUNDWATER CONTOUR MAP
AUGUST 2017**

DRAWN BY: J. PAPEZ	PROJ NO.: 269767-002/3
CHECKED BY: D. LITZ	FIGURE 8
APPROVED BY: G. CROCKFORD	
DATE: OCTOBER 2017	

FILE NO.: 269767-002_3-019.mxd

1540 Eisenhower Place
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Phone: 734.971.7080
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TRC - GIS
 Coordinate System: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl (Foot)
 Map Rotation
 Plot Date: 1/3/2018, 16:55:59 PM by SMAJOR -- LAYOUT: ANSIB(11"x17")
 Path: E:\ConsumersEnergy\GIS\2017_269767\269767_002_2_021.mxd



LEGEND

- BACKGROUND MONITORING WELL
- DEK BOTTOM ASH POND MONITORING WELL
- JCW BOTTOM ASH POND MONITORING WELL
- JCW LANDFILL MONITORING WELL
- SURFACE WATER GAUGING STATION
- MONITORING WELL (STATIC WATER LEVEL ONLY)
- SLURRY WALL (APPROXIMATE)
- GROUNDWATER ELEVATION CONTOUR (2' INTERVAL, DASHED WHERE INFERRED)
- GROUNDWATER ELEVATION (FEET, MSL)

- ### NOTES
1. BASE MAP IMAGERY FROM USDA – NATIONAL AGRICULTURE IMAGERY PROGRAM, 7/10/2016.
 2. WELL LOCATIONS SURVEYED BY ROWE PROFESSIONAL SERVICES COMPANY ON 11/4/2015.
 3. NOAA/NATIONAL OCEANIC SERVICE GREAT LAKES GAUGING STATION, ESSEXVILLE, MI (ID: 9075035).

1" = 1,000'
1:12,000

PROJECT:	
CONSUMERS ENERGY COMPANY DE KARN AND JC WEADOCK POWER PLANTS ESSEXVILLE, MICHIGAN	
TITLE:	
SHALLOW GROUNDWATER CONTOUR MAP SEPTEMBER 2017	
DRAWN BY: S. MAJOR	PROJ NO.: 269767-002
CHECKED BY: D. LITZ	FIGURE 3
APPROVED BY: G. CROCKFORD	
DATE: JANUARY 2018	
1540 Eisenhower Place Ann Arbor, MI 48108-3284 Phone: 734.971.7080 www.trcsolutions.com	
FILE NO.: 269767-002_3-021.mxd	



LEGEND

- BACKGROUND MONITORING WELL
- DEK BOTTOM ASH POND & LINED IMPOUNDMENT MONITORING WELL
- DEK BOTTOM ASH POND MONITORING WELL
- DEK LINED IMPOUNDMENT MONITORING WELL
- DECOMMISSIONED MONITORING WELL
- EXTRACTION WELL
- JCW BOTTOM ASH POND MONITORING WELL
- JCW LANDFILL MONITORING WELL
- MONITORING WELL (STATIC WATER LEVEL ONLY)
- PIEZOMETER
- SLURRY WALL (APPROXIMATE)
- GROUNDWATER ELEVATION CONTOUR (2' INTERVAL, DASHED WHERE INFERRED)
- GROUNDWATER ELEVATION (FEET, MSL)

- ### NOTES
- BASE MAP IMAGERY FROM USDA – NATIONAL AGRICULTURE IMAGERY PROGRAM, 7/10/2016.
 - WELL LOCATIONS SURVEYED BY ROWE PROFESSIONAL SERVICES COMPANY ON 11/4/2015.
 - NOAA/NATIONAL OCEANIC SERVICE GREAT LAKES GAUGING STATION, ESSEXVILLE, MI (ID: 9075035).
 - MONITORING WELL DEK- MW-18001 INSTALLED IN MAY 2018. SURVEY DATA NOT YET AVAILABLE.

1" = 1,000'
1:12,000

PROJECT:		CONSUMERS ENERGY COMPANY DE KARN AND JC WEADOCK POWER PLANTS ESSEXVILLE, MICHIGAN	
TITLE:		SHALLOW GROUNDWATER CONTOUR MAP APRIL 2018	
DRAWN BY:	S. MAJOR	PROJ NO.:	290805-001
CHECKED BY:	C. SCIESZKA	FIGURE 2	
APPROVED BY:	D. LITZ		
DATE:	OCTOBER 2018		

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

FILE NO.: 290805-001-001x.mxd



LEGEND

- BACKGROUND MONITORING WELL
- DEK BOTTOM ASH POND & LINED IMPOUNDMENT MONITORING WELL
- DEK BOTTOM ASH POND MONITORING WELL
- DEK LINED IMPOUNDMENT MONITORING WELL
- DECOMMISSIONED MONITORING WELL
- EXTRACTION WELL
- JCW BEDROCK MONITORING WELL
- JCW BOTTOM ASH POND MONITORING WELL
- JCW LANDFILL MONITORING WELL
- MONITORING WELL (STATIC WATER LEVEL ONLY)
- PIEZOMETER
- GROUNDWATER ELEVATION CONTOUR (2' INTERVAL, DASHED WHERE INFERRED)
- SLURRY WALL (APPROXIMATE)
- (580.85) GROUNDWATER ELEVATION (FEET, MSL)

- ### NOTES
1. BASE MAP IMAGERY FROM USDA – NATIONAL AGRICULTURE IMAGERY PROGRAM, 7/10/2016.
 2. WELL LOCATIONS SURVEYED BY ROWE PROFESSIONAL SERVICES COMPANY ON 11/4/2015.
 3. NOAA/NATIONAL OCEANIC SERVICE GREAT LAKES GAUGING STATION, ESSEXVILLE, MI (ID: 9075035).
 4. MONITORING WELL DEK- MW-18001 WAS INSTALLED IN MAY 2018. SURVEY DATA NOT YET AVAILABLE.

1" = 1,000'
1:12,000

PROJECT:	
CONSUMERS ENERGY COMPANY DE KARN AND JC WEADOCK POWER PLANTS ESSEXVILLE, MICHIGAN	
TITLE:	
SHALLOW GROUNDWATER CONTOUR MAP MAY 2018	
DRAWN BY: S. MAJOR	PROJ NO.: 290805-001
CHECKED BY: C. SCIESZKA	FIGURE 3
APPROVED BY: D. LITZ	
DATE: OCTOBER 2018	
<small>1540 Eisenhower Place Ann Arbor, MI 48108-3284 Phone: 734.971.7080 www.trcsolutions.com</small>	
<small>FILE NO.: 290805-001-005.mxd</small>	



LEGEND

- BACKGROUND MONITORING WELL
- DEK BOTTOM ASH POND & LINED IMPOUNDMENT MONITORING WELL
- DEK BOTTOM ASH POND MONITORING WELL
- DEK LINED IMPOUNDMENT MONITORING WELL
- JCW BOTTOM ASH POND MONITORING WELL
- JCW LANDFILL CCR WELL
- MONITORING WELL (STATIC WATER LEVEL ONLY)
- LEACHATE HEADWELL
- SURFACE WATER GAUGING STATION
- SLURRY WALL (APPROXIMATE)
- EXTENT OF GEOSYNTHETICS (KARN LINED IMPOUNDMENT)
- GROUNDWATER ELEVATION CONTOUR (2' INTERVAL, DASHED WHERE INFERRED)
- (580.50)** GROUNDWATER ELEVATION (FEET)
- (NM)** NOT MEASURED

NOTES

1. BASE MAP IMAGERY FROM USDA – NATIONAL AGRICULTURE IMAGERY PROGRAM, 7/10/2016.
2. WELL LOCATIONS SURVEYED BY ROWE PROFESSIONAL SERVICES COMPANY ON 11/4/2015.
3. NOAA/NATIONAL OCEANIC SERVICE GREAT LAKES GAUGING STATION, ESSEXVILLE, MI (ID: 9075035).
4. GROUNDWATER ELEVATION DATA RECORDED OCTOBER 22, 2018.
5. GROUNDWATER ELEVATIONS DISPLAYED IN FEET RELATIVE TO THE NORTH AMERICAN VERTICAL DATUM OF 1988.

0 1,000 2,000
 Feet
 1" = 1,000'
 1:12,000

PROJECT:		CONSUMERS ENERGY COMPANY DE KARN AND JC WEADOCK POWER PLANTS ESSEXVILLE, MICHIGAN	
TITLE:		SHALLOW GROUNDWATER CONTOUR MAP NOVEMBER 2018	
DRAWN BY:	S. MAJOR	PROJ NO.:	322173-001
CHECKED BY:	J. KRENZ	FIGURE 2	
APPROVED BY:	D. LITZ		
DATE:	MARCH 2019		

1540 Eisenhower Place
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FILE NO.: 290805-001-022.mxd



LEGEND

- DEK BOTTOM ASH POND & LINED IMPOUNDMENT MONITORING WELL
- DEK BOTTOM ASH POND MONITORING WELL
- DEK LINED IMPOUNDMENT MONITORING WELL
- DECOMMISSIONED MONITORING WELL
- MONITORING WELL (STATIC ONLY)
- SURFACE WATER GAUGING STATION
- NATURE AND EXTENT WELL
- SLURRY WALL (APPROXIMATE)
- EXTENT OF GEOSYNTHETICS (KARN LINED IMPOUNDMENT)
- GROUNDWATER ELEVATION CONTOUR (2' INTERVAL, DASHED WHERE INFERRED)
- (580.50)** GROUNDWATER ELEVATION (FEET)
- (NM)** NOT MEASURED

- ### NOTES
- BASE MAP IMAGERY FROM GOOGLE EARTH PRO, 2018.
 - WELL LOCATIONS SURVEYED BY ROWE PROFESSIONAL SERVICES COMPANY ON 11/4/2015.
 - NOAA/NATIONAL OCEANIC SERVICE GREAT LAKES GAUGING STATION, ESSEXVILLE, MI (ID: 9075035).
 - GROUNDWATER ELEVATION DATA RECORDED MARCH 11, 2019.
 - GROUNDWATER ELEVATIONS DISPLAYED IN FEET RELATIVE TO THE NORTH AMERICAN VERTICAL DATUM OF 1988.
 - DATA FROM APRIL 7, 2019. NO DATA RECORDED AT NOAA GAUGING STATION ON APRIL 8, 2019.

0 600 1200
Feet

1" = 600'
1:7,200

PROJECT:		CONSUMERS ENERGY COMPANY DE KARN POWER PLANT ESSEXVILLE, MICHIGAN	
TITLE:		SHALLOW GROUNDWATER CONTOUR MAP APRIL 2019	
DRAWN BY:	S. MAJOR	PROJ NO.:	322172-001
CHECKED BY:	J. KRENZ	FIGURE 3	
APPROVED BY:	D. LITZ		
DATE:	JANUARY 2020		
		1540 Eisenhower Place Ann Arbor, MI 48108-3284 Phone: 734.971.7080 www.trccompanies.com	
FILE NO.:	322172_3-004-02.mxd		



LEGEND

- DEK BOTTOM ASH POND & LINED IMPOUNDMENT MONITORING WELL
- DEK BOTTOM ASH POND MONITORING WELL
- DEK LINED IMPOUNDMENT MONITORING WELL
- DECOMMISSIONED MONITORING WELL
- MONITORING WELL (STATIC WATER LEVEL ONLY)
- SURFACE WATER GAUGING STATION
- NATURE AND EXTENT WELL
- SLURRY WALL (APPROXIMATE)
- GROUNDWATER ELEVATION CONTOUR (1' INTERVAL, DASHED WHERE INFERRED)
- EXTENT OF GEOSYNTHETICS (KARN LINED IMPOUNDMENT)
- (580.21) GROUNDWATER ELEVATION (FEET)
- (NM) NOT MEASURED

- NOTES**
- BASE MAP IMAGERY FROM GOOGLE EARTH PRO, 2018.
 - WELL LOCATIONS SURVEYED BY ROWE PROFESSIONAL SERVICES COMPANY ON 11/4/2015.
 - NOAA/NATIONAL OCEANIC SERVICE GREAT LAKES GAUGING STATION, ESSEXVILLE, MI (ID: 9075035).
 - A SINGLE WELL SYMBOL IS SHOWN FOR WELL PAIRS MW-01/MW-02 AND MW-03/MW-04 AS THE WELLS ARE LOCATED WITHIN 3-FT OF EACH OTHER.
 - GROUND WATER 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 DE KARN POWER PLANT ESSEXVILLE, MICHIGAN	
TITLE:		SHALLOW GROUNDWATER CONTOUR MAP OCTOBER 2019	
DRAWN BY:	S. MAJOR	PROJ NO.:	322172-001
CHECKED BY:	J. KRENZ	FIGURE 4	
APPROVED BY:	D. LITZ		
DATE:	JANUARY 2020		
		1540 Eisenhower Place Ann Arbor, MI 48108-3284 Phone: 734.971.7080 www.trccompanies.com	
FILE NO.:		322172_3-005-02.mxd	

Plot Date: 1/26/2021, 14:13:45 PM by SMAJOR -- LAYOUT: ANSI B(11"x17")
 Path: S:\PROJECTS\Consumers Energy Company\Michigan\CCR GW\2017_269767\367388-001-012.mxd
 Coordinate System: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl (Foot)
 Map Rotation: 0
 TRC - GIS



LEGEND

- DEK BOTTOM ASH POND & LINED IMPOUNDMENT MONITORING WELL
- DEK BOTTOM ASH POND MONITORING WELL
- DEK LINED IMPOUNDMENT MONITORING WELL
- DECOMMISSIONED MONITORING WELL
- MONITORING WELL (STATIC ONLY)
- SURFACE WATER GAUGING STATION
- NATURE AND EXTENT WELL
- SLURRY WALL (APPROXIMATE)
- LINED IMPOUNDMENT (COVENANT BOUNDARY)
- GROUNDWATER ELEVATION CONTOUR (1' INTERVAL, DASHED WHERE INFERRED)
- (580.50) GROUNDWATER ELEVATION (FEET)

NOTES

- BASE MAP IMAGERY FROM GOOGLE EARTH PRO, 2018.
- WELL LOCATIONS SURVEYED BY ROWE PROFESSIONAL SERVICES COMPANY ON 11/4/2015.
- NOA/NATIONAL OCEANIC SERVICE GREAT LAKES GAUGING STATION, ESSEXVILLE, MI (ID: 9075035).
- GROUNDWATER ELEVATIONS DISPLAYED IN FEET RELATIVE TO THE NORTH AMERICAN VERTICAL DATUM OF 1988.

0 600 1,200
Feet

1" = 600'
1:7,200

PROJECT:		CONSUMERS ENERGY COMPANY DE KARN POWER PLANT ESSEXVILLE, MICHIGAN	
TITLE:		SHALLOW GROUNDWATER CONTOUR MAP OCTOBER 5, 2020	
DRAWN BY:	S. MAJOR	PROJ NO.:	367388.0001
CHECKED BY:	J. KRENZ	FIGURE 3	
APPROVED BY:	D. LITZ		
DATE:	JANUARY 2021		

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FILE NO.: 367388-001-012.mxd

Appendix D

Laboratory Analytical Reports

To: CDBatts, Karn/Weadock

From: EBlaj, T-258

Date: May 23, 2021

Subject: RCRA GROUNDWATER MONITORING – DEK-JCW BACKGROUND WELLS – 2021 Q2

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

Darby Litz, Project Manager
TRC Companies, Inc.
1540 Eisenhower Place
Ann Arbor, MI 48108

Chemistry Project: 21-0525

TRC Environmental, Inc. conducted groundwater monitoring at the Karn/Weadock Background Wells area on 05/03/2021, for the 2nd Quarter monitoring requirement, as specified in the Sampling and Analysis Plan for the site. The samples were received for analysis by the Chemistry department of Laboratory Services on 05/05/2021.

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

Reviewed and approved by:

Emil Blaj
Sr. Technical Analyst
Project Lead



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

CASE NARRATIVE

I. Sample Receipt

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

II. Methodology

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

III. Results/Quality Control

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

DEFINITIONS / QUALIFIERS

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

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

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

Customer Name: Karn/Weadock Complex
Work Order ID: Q2_2020 DEK & JCW RCRA Background Wells
Date Received: 5/5/2021
Chemistry Project: 21-0525

<u>Sample #</u>	<u>Field Sample ID</u>	<u>Matrix</u>	<u>Sample Date</u>	<u>Site</u>
21-0525-01	MW-15002	Groundwater	05/03/2021 02:00 PM	DEK JCW Background
21-0525-02	MW-15008	Groundwater	05/03/2021 03:56 PM	DEK JCW Background
21-0525-03	MW-15016	Groundwater	05/03/2021 03:09 PM	DEK JCW Background
21-0525-04	MW-15019	Groundwater	05/03/2021 04:03 PM	DEK JCW Background
21-0525-05	DUP-04	Groundwater	05/03/2021 12:00 AM	DEK JCW Background
21-0525-06	FB-04	Water	05/03/2021 04:03 PM	DEK JCW Background

Laboratory Services
A CENTURY OF EXCELLENCE

Sample Site: **DEK JCW Background**
Field Sample ID: **MW-15002**
Lab Sample ID: 21-0525-01
Matrix: Groundwater

Laboratory Project: **21-0525**
Collect Date: 05/03/2021
Collect Time: 02:00 PM

Mercury by EPA 7470A, Total, Aqueous

Aliquot: 21-0525-01-C01-A01

Analyst: TMR

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Mercury	ND		ug/L	0.2	05/12/2021	AB21-0512-13

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

Aliquot: 21-0525-01-C01-A02

Analyst: EB

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Antimony	ND		ug/L	1	05/13/2021	AB21-0514-08
Arsenic	1		ug/L	1	05/13/2021	AB21-0514-08
Barium	1040		ug/L	5	05/13/2021	AB21-0514-08
Beryllium	ND		ug/L	1	05/13/2021	AB21-0514-08
Boron	102		ug/L	20	05/13/2021	AB21-0514-08
Cadmium	ND		ug/L	0.2	05/13/2021	AB21-0514-08
Calcium	364000		ug/L	1000	05/14/2021	AB21-0514-08
Chromium	ND		ug/L	1	05/13/2021	AB21-0514-08
Cobalt	ND		ug/L	6	05/13/2021	AB21-0514-08
Copper	1		ug/L	1	05/13/2021	AB21-0514-08
Iron	14600		ug/L	20	05/13/2021	AB21-0514-08
Lead	ND		ug/L	1	05/13/2021	AB21-0514-08
Lithium	19		ug/L	10	05/13/2021	AB21-0514-08
Magnesium	53200		ug/L	1000	05/14/2021	AB21-0514-08
Molybdenum	ND		ug/L	5	05/13/2021	AB21-0514-08
Nickel	7		ug/L	2	05/13/2021	AB21-0514-08
Potassium	6120		ug/L	100	05/14/2021	AB21-0514-08
Selenium	ND		ug/L	1	05/13/2021	AB21-0514-08
Silver	ND		ug/L	0.2	05/13/2021	AB21-0514-08
Sodium	1490000		ug/L	1000	05/14/2021	AB21-0514-08
Thallium	ND		ug/L	2	05/13/2021	AB21-0514-08
Vanadium	12		ug/L	2	05/13/2021	AB21-0514-08
Zinc	ND		ug/L	10	05/13/2021	AB21-0514-08

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

Aliquot: 21-0525-01-C02-A01

Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Chloride	2630000		ug/L	1000	05/17/2021	AB21-0506-07
Fluoride	ND		ug/L	1000	05/06/2021	AB21-0506-07
Sulfate	31300		ug/L	1000	05/06/2021	AB21-0506-07

Total Dissolved Solids by SM 2540C

Aliquot: 21-0525-01-C03-A01

Analyst: CET

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Total Dissolved Solids	5390		mg/L	10	05/07/2021	AB21-0507-02



Analytical Report

Report Date: 05/23/21

Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **DEK JCW Background**
Field Sample ID: **MW-15002**
Lab Sample ID: 21-0525-01
Matrix: Groundwater

Laboratory Project: **21-0525**
Collect Date: 05/03/2021
Collect Time: 02:00 PM

Alkalinity by SM 2320B

Aliquot: 21-0525-01-C04-A01

Analyst: DLS

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Alkalinity Total	471000		ug/L	10000	05/11/2021	AB21-0511-11
Alkalinity Bicarbonate	471000		ug/L	10000	05/11/2021	AB21-0511-11
Alkalinity Carbonate	ND		ug/L	10000	05/11/2021	AB21-0511-11



Analytical Report

Report Date: 05/23/21

Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **DEK JCW Background**
 Field Sample ID: **MW-15008**
 Lab Sample ID: 21-0525-02
 Matrix: Groundwater

Laboratory Project: **21-0525**
 Collect Date: 05/03/2021
 Collect Time: 03:56 PM

Mercury by EPA 7470A, Total, Aqueous

Aliquot: 21-0525-02-C01-A01

Analyst: TMR

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Mercury	ND		ug/L	0.2	05/12/2021	AB21-0512-13

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

Aliquot: 21-0525-02-C01-A02

Analyst: EB

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Antimony	ND		ug/L	1	05/13/2021	AB21-0514-08
Arsenic	ND		ug/L	1	05/13/2021	AB21-0514-08
Barium	62		ug/L	5	05/13/2021	AB21-0514-08
Beryllium	ND		ug/L	1	05/13/2021	AB21-0514-08
Boron	121		ug/L	20	05/13/2021	AB21-0514-08
Cadmium	ND		ug/L	0.2	05/13/2021	AB21-0514-08
Calcium	105000		ug/L	1000	05/14/2021	AB21-0514-08
Chromium	ND		ug/L	1	05/13/2021	AB21-0514-08
Cobalt	ND		ug/L	6	05/13/2021	AB21-0514-08
Copper	1		ug/L	1	05/13/2021	AB21-0514-08
Iron	11300		ug/L	20	05/13/2021	AB21-0514-08
Lead	ND		ug/L	1	05/13/2021	AB21-0514-08
Lithium	15		ug/L	10	05/13/2021	AB21-0514-08
Magnesium	15500		ug/L	1000	05/14/2021	AB21-0514-08
Molybdenum	ND		ug/L	5	05/13/2021	AB21-0514-08
Nickel	ND		ug/L	2	05/13/2021	AB21-0514-08
Potassium	2450		ug/L	100	05/14/2021	AB21-0514-08
Selenium	ND		ug/L	1	05/13/2021	AB21-0514-08
Silver	ND		ug/L	0.2	05/13/2021	AB21-0514-08
Sodium	167000		ug/L	1000	05/14/2021	AB21-0514-08
Thallium	ND		ug/L	2	05/13/2021	AB21-0514-08
Vanadium	8		ug/L	2	05/13/2021	AB21-0514-08
Zinc	ND		ug/L	10	05/13/2021	AB21-0514-08

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

Aliquot: 21-0525-02-C02-A01

Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Chloride	225000		ug/L	1000	05/17/2021	AB21-0506-07
Fluoride	ND		ug/L	1000	05/06/2021	AB21-0506-07
Sulfate	ND		ug/L	1000	05/06/2021	AB21-0506-07

Total Dissolved Solids by SM 2540C

Aliquot: 21-0525-02-C03-A01

Analyst: CET

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Total Dissolved Solids	822		mg/L	10	05/07/2021	AB21-0507-02



Analytical Report

Report Date: 05/23/21

Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **DEK JCW Background**
Field Sample ID: **MW-15008**
Lab Sample ID: 21-0525-02
Matrix: Groundwater

Laboratory Project: **21-0525**
Collect Date: 05/03/2021
Collect Time: 03:56 PM

Alkalinity by SM 2320B

Aliquot: 21-0525-02-C04-A01

Analyst: DLS

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Alkalinity Total	360000		ug/L	10000	05/11/2021	AB21-0511-11
Alkalinity Bicarbonate	360000		ug/L	10000	05/11/2021	AB21-0511-11
Alkalinity Carbonate	ND		ug/L	10000	05/11/2021	AB21-0511-11

Laboratory Services
A CENTURY OF EXCELLENCE

Sample Site: **DEK JCW Background**
Field Sample ID: **MW-15016**
Lab Sample ID: 21-0525-03
Matrix: Groundwater

Laboratory Project: **21-0525**
Collect Date: 05/03/2021
Collect Time: 03:09 PM

Mercury by EPA 7470A, Total, Aqueous

Aliquot: 21-0525-03-C01-A01

Analyst: TMR

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Mercury	ND		ug/L	0.2	05/12/2021	AB21-0512-13

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

Aliquot: 21-0525-03-C01-A02

Analyst: EB

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Antimony	ND		ug/L	1	05/13/2021	AB21-0514-08
Arsenic	4		ug/L	1	05/13/2021	AB21-0514-08
Barium	53		ug/L	5	05/13/2021	AB21-0514-08
Beryllium	ND		ug/L	1	05/13/2021	AB21-0514-08
Boron	349		ug/L	20	05/13/2021	AB21-0514-08
Cadmium	ND		ug/L	0.2	05/13/2021	AB21-0514-08
Calcium	219000		ug/L	1000	05/14/2021	AB21-0514-08
Chromium	ND		ug/L	1	05/13/2021	AB21-0514-08
Cobalt	ND		ug/L	6	05/13/2021	AB21-0514-08
Copper	1		ug/L	1	05/13/2021	AB21-0514-08
Iron	1170		ug/L	20	05/13/2021	AB21-0514-08
Lead	ND		ug/L	1	05/13/2021	AB21-0514-08
Lithium	79		ug/L	10	05/13/2021	AB21-0514-08
Magnesium	26500		ug/L	1000	05/14/2021	AB21-0514-08
Molybdenum	ND		ug/L	5	05/13/2021	AB21-0514-08
Nickel	6		ug/L	2	05/13/2021	AB21-0514-08
Potassium	14600		ug/L	100	05/14/2021	AB21-0514-08
Selenium	ND		ug/L	1	05/13/2021	AB21-0514-08
Silver	ND		ug/L	0.2	05/13/2021	AB21-0514-08
Sodium	58200		ug/L	1000	05/14/2021	AB21-0514-08
Thallium	ND		ug/L	2	05/13/2021	AB21-0514-08
Vanadium	2		ug/L	2	05/13/2021	AB21-0514-08
Zinc	ND		ug/L	10	05/13/2021	AB21-0514-08

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

Aliquot: 21-0525-03-C02-A01

Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Chloride	108000		ug/L	1000	05/17/2021	AB21-0506-07
Fluoride	ND		ug/L	1000	05/06/2021	AB21-0506-07
Sulfate	255000		ug/L	1000	05/17/2021	AB21-0506-07

Total Dissolved Solids by SM 2540C

Aliquot: 21-0525-03-C03-A01

Analyst: CET

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Total Dissolved Solids	979		mg/L	10	05/07/2021	AB21-0507-02



Analytical Report

Report Date: 05/23/21

Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **DEK JCW Background**
Field Sample ID: **MW-15016**
Lab Sample ID: 21-0525-03
Matrix: Groundwater

Laboratory Project: **21-0525**
Collect Date: 05/03/2021
Collect Time: 03:09 PM

Alkalinity by SM 2320B

Aliquot: 21-0525-03-C04-A01

Analyst: DLS

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Alkalinity Total	372000		ug/L	10000	05/11/2021	AB21-0511-11
Alkalinity Bicarbonate	372000		ug/L	10000	05/11/2021	AB21-0511-11
Alkalinity Carbonate	ND		ug/L	10000	05/11/2021	AB21-0511-11

Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **DEK JCW Background**
 Field Sample ID: **MW-15019**
 Lab Sample ID: 21-0525-04
 Matrix: Groundwater

Laboratory Project: **21-0525**
 Collect Date: 05/03/2021
 Collect Time: 04:03 PM

Mercury by EPA 7470A, Total, Aqueous

Aliquot: 21-0525-04-C01-A01

Analyst: TMR

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Mercury	ND		ug/L	0.2	05/12/2021	AB21-0512-13

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

Aliquot: 21-0525-04-C01-A02

Analyst: EB

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Antimony	ND		ug/L	1	05/13/2021	AB21-0514-08
Arsenic	1		ug/L	1	05/13/2021	AB21-0514-08
Barium	335		ug/L	5	05/13/2021	AB21-0514-08
Beryllium	ND		ug/L	1	05/13/2021	AB21-0514-08
Boron	239		ug/L	20	05/13/2021	AB21-0514-08
Cadmium	ND		ug/L	0.2	05/13/2021	AB21-0514-08
Calcium	155000		ug/L	1000	05/14/2021	AB21-0514-08
Chromium	ND		ug/L	1	05/13/2021	AB21-0514-08
Cobalt	ND		ug/L	6	05/13/2021	AB21-0514-08
Copper	ND		ug/L	1	05/13/2021	AB21-0514-08
Iron	14300		ug/L	20	05/13/2021	AB21-0514-08
Lead	ND		ug/L	1	05/13/2021	AB21-0514-08
Lithium	12		ug/L	10	05/13/2021	AB21-0514-08
Magnesium	33400		ug/L	1000	05/14/2021	AB21-0514-08
Molybdenum	ND		ug/L	5	05/13/2021	AB21-0514-08
Nickel	28		ug/L	2	05/13/2021	AB21-0514-08
Potassium	2350		ug/L	100	05/14/2021	AB21-0514-08
Selenium	4		ug/L	1	05/13/2021	AB21-0514-08
Silver	ND		ug/L	0.2	05/13/2021	AB21-0514-08
Sodium	224000		ug/L	1000	05/14/2021	AB21-0514-08
Thallium	ND		ug/L	2	05/13/2021	AB21-0514-08
Vanadium	4		ug/L	2	05/13/2021	AB21-0514-08
Zinc	ND		ug/L	10	05/13/2021	AB21-0514-08

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

Aliquot: 21-0525-04-C02-A01

Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Chloride	344000		ug/L	1000	05/17/2021	AB21-0506-07
Fluoride	ND		ug/L	1000	05/06/2021	AB21-0506-07
Sulfate	52400		ug/L	1000	05/06/2021	AB21-0506-07

Total Dissolved Solids by SM 2540C

Aliquot: 21-0525-04-C03-A01

Analyst: CET

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Total Dissolved Solids	1160		mg/L	10	05/07/2021	AB21-0507-02



Analytical Report

Report Date: 05/23/21

Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **DEK JCW Background**
Field Sample ID: **MW-15019**
Lab Sample ID: 21-0525-04
Matrix: Groundwater

Laboratory Project: **21-0525**
Collect Date: 05/03/2021
Collect Time: 04:03 PM

Alkalinity by SM 2320B

Aliquot: 21-0525-04-C04-A01

Analyst: DLS

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Alkalinity Total	440000		ug/L	10000	05/11/2021	AB21-0511-11
Alkalinity Bicarbonate	440000		ug/L	10000	05/11/2021	AB21-0511-11
Alkalinity Carbonate	ND		ug/L	10000	05/11/2021	AB21-0511-11

Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **DEK JCW Background**
 Field Sample ID: **DUP-04**
 Lab Sample ID: 21-0525-05
 Matrix: Groundwater

Laboratory Project: **21-0525**
 Collect Date: 05/03/2021
 Collect Time: 12:00 AM

Mercury by EPA 7470A, Total, Aqueous

Aliquot: 21-0525-05-C01-A01

Analyst: TMR

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Mercury	ND		ug/L	0.2	05/12/2021	AB21-0512-13

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

Aliquot: 21-0525-05-C01-A02

Analyst: EB

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Antimony	ND		ug/L	1	05/13/2021	AB21-0514-08
Arsenic	ND		ug/L	1	05/13/2021	AB21-0514-08
Barium	1090		ug/L	5	05/13/2021	AB21-0514-08
Beryllium	ND		ug/L	1	05/13/2021	AB21-0514-08
Boron	102		ug/L	20	05/13/2021	AB21-0514-08
Cadmium	ND		ug/L	0.2	05/13/2021	AB21-0514-08
Calcium	379000		ug/L	1000	05/14/2021	AB21-0514-08
Chromium	1		ug/L	1	05/13/2021	AB21-0514-08
Cobalt	ND		ug/L	6	05/13/2021	AB21-0514-08
Copper	1		ug/L	1	05/13/2021	AB21-0514-08
Iron	14600		ug/L	20	05/13/2021	AB21-0514-08
Lead	ND		ug/L	1	05/13/2021	AB21-0514-08
Lithium	19		ug/L	10	05/13/2021	AB21-0514-08
Magnesium	53700		ug/L	1000	05/14/2021	AB21-0514-08
Molybdenum	ND		ug/L	5	05/13/2021	AB21-0514-08
Nickel	7		ug/L	2	05/13/2021	AB21-0514-08
Potassium	6220		ug/L	100	05/14/2021	AB21-0514-08
Selenium	ND		ug/L	1	05/13/2021	AB21-0514-08
Silver	ND		ug/L	0.2	05/13/2021	AB21-0514-08
Sodium	1510000		ug/L	1000	05/14/2021	AB21-0514-08
Thallium	ND		ug/L	2	05/13/2021	AB21-0514-08
Vanadium	13		ug/L	2	05/13/2021	AB21-0514-08
Zinc	ND		ug/L	10	05/13/2021	AB21-0514-08

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

Aliquot: 21-0525-05-C02-A01

Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Chloride	2640000		ug/L	1000	05/18/2021	AB21-0506-07
Fluoride	ND		ug/L	1000	05/06/2021	AB21-0506-07
Sulfate	32000		ug/L	1000	05/06/2021	AB21-0506-07

Total Dissolved Solids by SM 2540C

Aliquot: 21-0525-05-C03-A01

Analyst: CET

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Total Dissolved Solids	5330		mg/L	10	05/07/2021	AB21-0507-02



Analytical Report

Report Date: 05/23/21

Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **DEK JCW Background**
Field Sample ID: **DUP-04**
Lab Sample ID: 21-0525-05
Matrix: Groundwater

Laboratory Project: **21-0525**
Collect Date: 05/03/2021
Collect Time: 12:00 AM

Alkalinity by SM 2320B

Aliquot: 21-0525-05-C04-A01

Analyst: DLS

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Alkalinity Total	475000		ug/L	10000	05/11/2021	AB21-0511-11
Alkalinity Bicarbonate	475000		ug/L	10000	05/11/2021	AB21-0511-11
Alkalinity Carbonate	ND		ug/L	10000	05/11/2021	AB21-0511-11

Laboratory Services
A CENTURY OF EXCELLENCE

Sample Site: **DEK JCW Background**
 Field Sample ID: **FB-04**
 Lab Sample ID: 21-0525-06
 Matrix: Water

Laboratory Project: **21-0525**
 Collect Date: 05/03/2021
 Collect Time: 04:03 PM

Mercury by EPA 7470A, Total, Aqueous

Aliquot: 21-0525-06-C01-A01

Analyst: TMR

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Mercury	ND		ug/L	0.2	05/12/2021	AB21-0512-13

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

Aliquot: 21-0525-06-C01-A02

Analyst: EB

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Antimony	ND		ug/L	1	05/13/2021	AB21-0514-08
Arsenic	ND		ug/L	1	05/13/2021	AB21-0514-08
Barium	ND		ug/L	5	05/13/2021	AB21-0514-08
Beryllium	ND		ug/L	1	05/13/2021	AB21-0514-08
Boron	ND		ug/L	20	05/13/2021	AB21-0514-08
Cadmium	ND		ug/L	0.2	05/13/2021	AB21-0514-08
Calcium	ND		ug/L	1000	05/14/2021	AB21-0514-08
Chromium	ND		ug/L	1	05/13/2021	AB21-0514-08
Cobalt	ND		ug/L	6	05/13/2021	AB21-0514-08
Copper	ND		ug/L	1	05/13/2021	AB21-0514-08
Iron	ND		ug/L	20	05/13/2021	AB21-0514-08
Lead	ND		ug/L	1	05/13/2021	AB21-0514-08
Lithium	ND		ug/L	10	05/13/2021	AB21-0514-08
Magnesium	ND		ug/L	1000	05/14/2021	AB21-0514-08
Molybdenum	ND		ug/L	5	05/13/2021	AB21-0514-08
Nickel	ND		ug/L	2	05/13/2021	AB21-0514-08
Potassium	ND		ug/L	100	05/14/2021	AB21-0514-08
Selenium	ND		ug/L	1	05/13/2021	AB21-0514-08
Silver	ND		ug/L	0.2	05/13/2021	AB21-0514-08
Sodium	ND		ug/L	1000	05/14/2021	AB21-0514-08
Thallium	ND		ug/L	2	05/13/2021	AB21-0514-08
Vanadium	ND		ug/L	2	05/13/2021	AB21-0514-08
Zinc	ND		ug/L	10	05/13/2021	AB21-0514-08

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

Aliquot: 21-0525-06-C02-A01

Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Chloride	ND		ug/L	1000	05/06/2021	AB21-0506-07
Fluoride	ND		ug/L	1000	05/06/2021	AB21-0506-07
Sulfate	ND		ug/L	1000	05/06/2021	AB21-0506-07

Data Qualifiers	Exception Summary
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No exceptions occurred.

CONSUMERS
ENERGY

Chemistry Department
General Standard Operating Procedure

PROC CHEM-1.2.01
PAGE 1 OF 2
REVISION 3
ATTACHMENT A

TITLE: SAMPLE LOG-IN – SHIPMENT INSPECTION FORM

Project Log-In Number: 21-0525

Inspection Date: 05/05/21 Inspection By: CUH

Sample Origin/Project Name: KLW Background

Shipment Delivered By: Enter the type of shipment carrier.

Pony _____ FedEx UPS _____ USPS _____ Airborne _____

Other/Hand Carry (whom) _____

Tracking Number: 786769796241 Shipping Form Attached: Yes No _____

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

Cooler (1) Cardboard Box _____ Custom Case _____ Envelope/Mailer _____

Loose/Unpackaged Containers _____ Other _____

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

Damaged Shipment Observed: None Dented _____ Leaking _____

Other _____

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

Shipping Containers Received: Opened _____ Sealed

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

CoC Work Request _____ Air Data Sheet _____ Other _____

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

As-Received Temperature Range 0.3 - 1.6°C Samples Received on Ice: Yes No _____

M&TE # and Expiration 015402

6.4.21

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

Container Type	Water	Soil	Other	Broken	Leaking
VOA (40mL or <u>60mL</u>)	<u>10</u>	_____	_____	_____	_____
Quart/Liter (g/p)	_____	_____	_____	_____	_____
9-oz (amber glass jar)	_____	_____	_____	_____	_____
2-oz (amber glass)	_____	_____	_____	_____	_____
125 mL (plastic)	<u>12</u>	_____	_____	_____	_____
24 mL vial (glass)	_____	_____	_____	_____	_____
250 500 mL (plastic)	<u>5</u>	_____	_____	_____	_____
Other _____	_____	_____	_____	_____	_____

CHAIN OF CUSTODY



CONSUMERS ENERGY COMPANY – LABORATORY SERVICES

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

SAMPLING SITE				PROJECT NUMBER			ANALYSIS REQUESTED							Page 1 of 1			
DEK & JCW Background- 2021 Q2 RCRA				21-0525			Total Metals	Anions	TDS	Alkalinity							SEND REPORT TO CDBatts
SAMPLING TEAM				DATE SHIPPED	SITE SKETCHED ATTACHED? CIRCLE ONE												
TRC				5-4-21	YES NO												PHONE _____
CE CONTROL #	SAMPLE DATE	SAMPLE TIME	SAMPLE MATRIX	SAMPLE DESCRIPTION / LOCATION	DEPTH (ft)	# OF CONTAINERS											REMARKS
21-0525-01	5-3-21	1400	GW	MW-15002		3	X	X	X	X							
-02	5-3-21	1556	GW	MW-15008		3	X	X	X	X							
-03	5-3-21	1509	GW	MW-15016		3	X	X	X	X							
-04	5-3-21	1603	GW	MW-15019		3	X	X	X	X							
-05	5-3-21	—	GW	DUP-Background		3	X	X	X	X							
√ -06	5-3-21	1603	W	FB- Background		1	X	X									
RELINQUISHED BY (SIGNATURE)				DATE/TIME		RECEIVED BY (SIGNATURE)		COMMENTS 0.3-1.6°C 015402									
				5-4-21 11630		Fedex											
RELINQUISHED BY (SIGNATURE)				DATE/TIME		RECEIVED BY (SIGNATURE)		ORIGINAL TO LAB COPY TO CUSTOMER									
				5-5-21 1100													

To: CDBatts, Karn/Weadock

From: EBlaj, T-258

Date: May 23, 2021

Subject: RCRA GROUNDWATER MONITORING – DEK BOTTOM ASH POND WELLS – 2021 Q2

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

Darby Litz, Project Manager
TRC Companies, Inc.
1540 Eisenhower Place
Ann Arbor, MI 48108

Chemistry Project: 21-0528

TRC Environmental, Inc. conducted groundwater monitoring at the DEKarn Bottom Ash Pond Wells area on 05/03/2021 for the 2nd Quarter monitoring requirement, as specified in the Sampling and Analysis Plan for the site. The samples were received for analysis by the Chemistry department of Laboratory Services on 05/05/2021.

The report that follows presents the results of the requested analytical testing; the results apply only to the samples as received. All samples have been analyzed in accordance with the 2016 TNI Standard and the applicable A2LA accreditation scope for Laboratory Services. Any exceptions to applicable test method criteria and standard compliance are noted in the Case Narrative, or flagged with applicable qualifiers in the analytical results section.

Reviewed and approved by:

Emil Blaj
Sr. Technical Analyst
Project Lead



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

CASE NARRATIVE

I. Sample Receipt

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

II. Methodology

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

III. Results/Quality Control

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

DEFINITIONS / QUALIFIERS

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

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

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

Work Order Sample Summary

Customer Name: Karn/Weadock Complex
Work Order ID: Q2-2021 DEK RCRA Bottom Ash Pond Wells
Date Received: 5/5/2021
Chemistry Project: 21-0528

<u>Sample #</u>	<u>Field Sample ID</u>	<u>Matrix</u>	<u>Sample Date</u>	<u>Site</u>
21-0528-01	DEK-MW-15002	Groundwater	05/03/2021 01:08 PM	DEK Bottom Ash Pond
21-0528-02	DEK-MW-15004	Groundwater	05/03/2021 02:10 PM	DEK Bottom Ash Pond
21-0528-03	DEK-MW-15005	Groundwater	05/03/2021 11:35 AM	DEK Bottom Ash Pond
21-0528-04	DEK-MW-15006	Groundwater	05/03/2021 10:25 AM	DEK Bottom Ash Pond
21-0528-05	DUP-DEK-BAP	Groundwater	05/03/2021 12:00 AM	DEK Bottom Ash Pond
21-0528-06	FB-DEK-BAP	Water	05/03/2021 11:35 AM	DEK Bottom Ash Pond

Laboratory Services
A CENTURY OF EXCELLENCE

Sample Site: **DEK Bottom Ash Pond**
Field Sample ID: **DEK-MW-15002**
Lab Sample ID: 21-0528-01
Matrix: Groundwater

Laboratory Project: **21-0528**
Collect Date: 05/03/2021
Collect Time: 01:08 PM

Mercury by EPA 7470A, Total, Aqueous

Aliquot: 21-0528-01-C01-A01

Analyst: TMR

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Mercury	ND		ug/L	0.2	05/12/2021	AB21-0512-13

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

Aliquot: 21-0528-01-C01-A02

Analyst: EB

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Antimony	ND		ug/L	1	05/13/2021	AB21-0514-08
Arsenic	2		ug/L	1	05/13/2021	AB21-0514-08
Barium	211		ug/L	5	05/13/2021	AB21-0514-08
Beryllium	ND		ug/L	1	05/13/2021	AB21-0514-08
Boron	1420		ug/L	20	05/13/2021	AB21-0514-08
Cadmium	ND		ug/L	0.2	05/13/2021	AB21-0514-08
Calcium	148000		ug/L	1000	05/14/2021	AB21-0514-08
Chromium	ND		ug/L	1	05/13/2021	AB21-0514-08
Cobalt	ND		ug/L	6	05/13/2021	AB21-0514-08
Copper	ND		ug/L	1	05/13/2021	AB21-0514-08
Iron	2800		ug/L	20	05/13/2021	AB21-0514-08
Lead	ND		ug/L	1	05/13/2021	AB21-0514-08
Lithium	36		ug/L	10	05/13/2021	AB21-0514-08
Magnesium	33100		ug/L	1000	05/14/2021	AB21-0514-08
Molybdenum	ND		ug/L	5	05/13/2021	AB21-0514-08
Nickel	2		ug/L	2	05/13/2021	AB21-0514-08
Potassium	8510		ug/L	100	05/14/2021	AB21-0514-08
Selenium	ND		ug/L	1	05/13/2021	AB21-0514-08
Silver	ND		ug/L	0.2	05/13/2021	AB21-0514-08
Sodium	110000		ug/L	1000	05/14/2021	AB21-0514-08
Thallium	ND		ug/L	2	05/13/2021	AB21-0514-08
Vanadium	ND		ug/L	2	05/13/2021	AB21-0514-08
Zinc	ND		ug/L	10	05/13/2021	AB21-0514-08

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

Aliquot: 21-0528-01-C02-A01

Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Chloride	148000		ug/L	1000	05/17/2021	AB21-0506-07
Fluoride	ND		ug/L	1000	05/06/2021	AB21-0506-07
Sulfate	216000		ug/L	1000	05/17/2021	AB21-0506-07

Total Dissolved Solids by SM 2540C

Aliquot: 21-0528-01-C03-A01

Analyst: CET

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Total Dissolved Solids	926		mg/L	10	05/07/2021	AB21-0507-02

Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **DEK Bottom Ash Pond**
 Field Sample ID: **DEK-MW-15002**
 Lab Sample ID: 21-0528-01
 Matrix: Groundwater

Laboratory Project: **21-0528**
 Collect Date: 05/03/2021
 Collect Time: 01:08 PM

Alkalinity by SM 2320B

Aliquot: 21-0528-01-C04-A01

Analyst: DLS

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Alkalinity Total	311000		ug/L	10000	05/11/2021	AB21-0511-11
Alkalinity Bicarbonate	311000		ug/L	10000	05/11/2021	AB21-0511-11
Alkalinity Carbonate	ND		ug/L	10000	05/11/2021	AB21-0511-11

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

Aliquot: 21-0528-01-C06-A01

Analyst: EB

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Antimony	ND		ug/L	1	05/19/2021	AB21-0519-19
Arsenic	2		ug/L	1	05/19/2021	AB21-0519-19
Barium	169		ug/L	5	05/19/2021	AB21-0519-19
Beryllium	ND		ug/L	1	05/19/2021	AB21-0519-19
Boron	1440		ug/L	20	05/19/2021	AB21-0519-19
Cadmium	ND		ug/L	0.2	05/19/2021	AB21-0519-19
Calcium	145000		ug/L	1000	05/20/2021	AB21-0519-19
Chromium	3		ug/L	1	05/19/2021	AB21-0519-19
Cobalt	ND		ug/L	6	05/19/2021	AB21-0519-19
Copper	ND		ug/L	1	05/19/2021	AB21-0519-19
Iron	1590		ug/L	20	05/19/2021	AB21-0519-19
Lead	ND		ug/L	1	05/19/2021	AB21-0519-19
Lithium	37		ug/L	10	05/19/2021	AB21-0519-19
Magnesium	32800		ug/L	1000	05/20/2021	AB21-0519-19
Molybdenum	ND		ug/L	5	05/19/2021	AB21-0519-19
Nickel	ND		ug/L	2	05/19/2021	AB21-0519-19
Potassium	8210		ug/L	100	05/20/2021	AB21-0519-19
Selenium	2		ug/L	1	05/19/2021	AB21-0519-19
Silver	ND		ug/L	0.2	05/19/2021	AB21-0519-19
Sodium	103000		ug/L	1000	05/20/2021	AB21-0519-19
Thallium	ND		ug/L	2	05/19/2021	AB21-0519-19
Vanadium	ND		ug/L	2	05/19/2021	AB21-0519-19
Zinc	ND		ug/L	10	05/19/2021	AB21-0519-19



Analytical Report

Report Date: 05/23/21

Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **DEK Bottom Ash Pond**
 Field Sample ID: **DEK-MW-15004**
 Lab Sample ID: 21-0528-02
 Matrix: Groundwater

Laboratory Project: **21-0528**
 Collect Date: 05/03/2021
 Collect Time: 02:10 PM

Mercury by EPA 7470A, Total, Aqueous

Aliquot: 21-0528-02-C01-A01

Analyst: TMR

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Mercury	ND		ug/L	0.2	05/12/2021	AB21-0512-13

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

Aliquot: 21-0528-02-C01-A02

Analyst: EB

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Antimony	1		ug/L	1	05/13/2021	AB21-0514-08
Arsenic	194		ug/L	1	05/13/2021	AB21-0514-08
Barium	104		ug/L	5	05/13/2021	AB21-0514-08
Beryllium	ND		ug/L	1	05/13/2021	AB21-0514-08
Boron	914		ug/L	20	05/13/2021	AB21-0514-08
Cadmium	ND		ug/L	0.2	05/13/2021	AB21-0514-08
Calcium	60200		ug/L	1000	05/14/2021	AB21-0514-08
Chromium	ND		ug/L	1	05/13/2021	AB21-0514-08
Cobalt	ND		ug/L	6	05/13/2021	AB21-0514-08
Copper	ND		ug/L	1	05/13/2021	AB21-0514-08
Iron	1980		ug/L	20	05/13/2021	AB21-0514-08
Lead	ND		ug/L	1	05/13/2021	AB21-0514-08
Lithium	34		ug/L	10	05/13/2021	AB21-0514-08
Magnesium	10600		ug/L	1000	05/14/2021	AB21-0514-08
Molybdenum	11		ug/L	5	05/13/2021	AB21-0514-08
Nickel	ND		ug/L	2	05/13/2021	AB21-0514-08
Potassium	4630		ug/L	100	05/14/2021	AB21-0514-08
Selenium	ND		ug/L	1	05/13/2021	AB21-0514-08
Silver	ND		ug/L	0.2	05/13/2021	AB21-0514-08
Sodium	85700		ug/L	1000	05/14/2021	AB21-0514-08
Thallium	ND		ug/L	2	05/13/2021	AB21-0514-08
Vanadium	ND		ug/L	2	05/13/2021	AB21-0514-08
Zinc	ND		ug/L	10	05/13/2021	AB21-0514-08

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

Aliquot: 21-0528-02-C02-A01

Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Chloride	68000		ug/L	1000	05/06/2021	AB21-0506-07
Fluoride	ND		ug/L	1000	05/06/2021	AB21-0506-07
Sulfate	143000		ug/L	1000	05/06/2021	AB21-0506-07

Total Dissolved Solids by SM 2540C

Aliquot: 21-0528-02-C03-A01

Analyst: CET

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Total Dissolved Solids	493		mg/L	10	05/07/2021	AB21-0507-02



Analytical Report

Report Date: 05/23/21

Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **DEK Bottom Ash Pond**
Field Sample ID: **DEK-MW-15004**
Lab Sample ID: 21-0528-02
Matrix: Groundwater

Laboratory Project: **21-0528**
Collect Date: 05/03/2021
Collect Time: 02:10 PM

Alkalinity by SM 2320B

Aliquot: 21-0528-02-C04-A01

Analyst: DLS

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Alkalinity Total	152000		ug/L	10000	05/11/2021	AB21-0511-11
Alkalinity Bicarbonate	152000		ug/L	10000	05/11/2021	AB21-0511-11
Alkalinity Carbonate	ND		ug/L	10000	05/11/2021	AB21-0511-11

Laboratory Services
A CENTURY OF EXCELLENCE

Sample Site: **DEK Bottom Ash Pond**
Field Sample ID: **DEK-MW-15005**
Lab Sample ID: 21-0528-03
Matrix: Groundwater

Laboratory Project: **21-0528**
Collect Date: 05/03/2021
Collect Time: 11:35 AM

Mercury by EPA 7470A, Total, Aqueous

Aliquot: 21-0528-03-C01-A01

Analyst: TMR

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Mercury	ND		ug/L	0.2	05/12/2021	AB21-0512-13

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

Aliquot: 21-0528-03-C01-A02

Analyst: EB

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Antimony	ND		ug/L	1	05/13/2021	AB21-0514-08
Arsenic	45		ug/L	1	05/13/2021	AB21-0514-08
Barium	173		ug/L	5	05/13/2021	AB21-0514-08
Beryllium	ND		ug/L	1	05/13/2021	AB21-0514-08
Boron	926		ug/L	20	05/13/2021	AB21-0514-08
Cadmium	ND		ug/L	0.2	05/13/2021	AB21-0514-08
Calcium	95600		ug/L	1000	05/14/2021	AB21-0514-08
Chromium	ND		ug/L	1	05/13/2021	AB21-0514-08
Cobalt	ND		ug/L	6	05/13/2021	AB21-0514-08
Copper	1		ug/L	1	05/13/2021	AB21-0514-08
Iron	421		ug/L	20	05/13/2021	AB21-0514-08
Lead	ND		ug/L	1	05/13/2021	AB21-0514-08
Lithium	38		ug/L	10	05/13/2021	AB21-0514-08
Magnesium	14300		ug/L	1000	05/14/2021	AB21-0514-08
Molybdenum	8		ug/L	5	05/13/2021	AB21-0514-08
Nickel	3		ug/L	2	05/13/2021	AB21-0514-08
Potassium	6550		ug/L	100	05/14/2021	AB21-0514-08
Selenium	1		ug/L	1	05/13/2021	AB21-0514-08
Silver	ND		ug/L	0.2	05/13/2021	AB21-0514-08
Sodium	67500		ug/L	1000	05/14/2021	AB21-0514-08
Thallium	ND		ug/L	2	05/13/2021	AB21-0514-08
Vanadium	ND		ug/L	2	05/13/2021	AB21-0514-08
Zinc	ND		ug/L	10	05/13/2021	AB21-0514-08

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

Aliquot: 21-0528-03-C02-A01

Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Chloride	65200		ug/L	1000	05/06/2021	AB21-0506-07
Fluoride	ND		ug/L	1000	05/06/2021	AB21-0506-07
Sulfate	50800		ug/L	1000	05/06/2021	AB21-0506-07

Total Dissolved Solids by SM 2540C

Aliquot: 21-0528-03-C03-A01

Analyst: CET

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Total Dissolved Solids	534		mg/L	10	05/07/2021	AB21-0507-02



Analytical Report

Report Date: 05/23/21

Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **DEK Bottom Ash Pond**
Field Sample ID: **DEK-MW-15005**
Lab Sample ID: 21-0528-03
Matrix: Groundwater

Laboratory Project: **21-0528**
Collect Date: 05/03/2021
Collect Time: 11:35 AM

Alkalinity by SM 2320B

Aliquot: 21-0528-03-C04-A01

Analyst: DLS

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Alkalinity Total	314000		ug/L	10000	05/11/2021	AB21-0511-11
Alkalinity Bicarbonate	314000		ug/L	10000	05/11/2021	AB21-0511-11
Alkalinity Carbonate	ND		ug/L	10000	05/11/2021	AB21-0511-11



Analytical Report

Report Date: 05/23/21

Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **DEK Bottom Ash Pond**
 Field Sample ID: **DEK-MW-15006**
 Lab Sample ID: 21-0528-04
 Matrix: Groundwater

Laboratory Project: **21-0528**
 Collect Date: 05/03/2021
 Collect Time: 10:25 AM

Mercury by EPA 7470A, Total, Aqueous

Aliquot: 21-0528-04-C01-A01

Analyst: TMR

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Mercury	ND		ug/L	0.2	05/12/2021	AB21-0512-13

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

Aliquot: 21-0528-04-C01-A02

Analyst: EB

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Antimony	ND		ug/L	1	05/13/2021	AB21-0514-08
Arsenic	24		ug/L	1	05/13/2021	AB21-0514-08
Barium	139		ug/L	5	05/13/2021	AB21-0514-08
Beryllium	ND		ug/L	1	05/13/2021	AB21-0514-08
Boron	938		ug/L	20	05/13/2021	AB21-0514-08
Cadmium	ND		ug/L	0.2	05/13/2021	AB21-0514-08
Calcium	115000		ug/L	1000	05/14/2021	AB21-0514-08
Chromium	ND		ug/L	1	05/13/2021	AB21-0514-08
Cobalt	ND		ug/L	6	05/13/2021	AB21-0514-08
Copper	ND		ug/L	1	05/13/2021	AB21-0514-08
Iron	1560		ug/L	20	05/13/2021	AB21-0514-08
Lead	ND		ug/L	1	05/13/2021	AB21-0514-08
Lithium	21		ug/L	10	05/13/2021	AB21-0514-08
Magnesium	12400		ug/L	1000	05/14/2021	AB21-0514-08
Molybdenum	9		ug/L	5	05/13/2021	AB21-0514-08
Nickel	7		ug/L	2	05/13/2021	AB21-0514-08
Potassium	9170		ug/L	100	05/14/2021	AB21-0514-08
Selenium	ND		ug/L	1	05/13/2021	AB21-0514-08
Silver	ND		ug/L	0.2	05/13/2021	AB21-0514-08
Sodium	122000		ug/L	1000	05/14/2021	AB21-0514-08
Thallium	ND		ug/L	2	05/13/2021	AB21-0514-08
Vanadium	ND		ug/L	2	05/13/2021	AB21-0514-08
Zinc	ND		ug/L	10	05/13/2021	AB21-0514-08

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

Aliquot: 21-0528-04-C02-A01

Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Chloride	63500		ug/L	1000	05/06/2021	AB21-0506-07
Fluoride	ND		ug/L	1000	05/06/2021	AB21-0506-07
Sulfate	324000		ug/L	1000	05/17/2021	AB21-0506-07

Total Dissolved Solids by SM 2540C

Aliquot: 21-0528-04-C03-A01

Analyst: CET

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Total Dissolved Solids	790		mg/L	10	05/07/2021	AB21-0507-02



Analytical Report

Report Date: 05/23/21

Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **DEK Bottom Ash Pond**
Field Sample ID: **DEK-MW-15006**
Lab Sample ID: 21-0528-04
Matrix: Groundwater

Laboratory Project: **21-0528**
Collect Date: 05/03/2021
Collect Time: 10:25 AM

Alkalinity by SM 2320B

Aliquot: 21-0528-04-C04-A01

Analyst: DLS

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Alkalinity Total	203000		ug/L	10000	05/11/2021	AB21-0511-11
Alkalinity Bicarbonate	203000		ug/L	10000	05/11/2021	AB21-0511-11
Alkalinity Carbonate	ND		ug/L	10000	05/11/2021	AB21-0511-11

Laboratory Services
A CENTURY OF EXCELLENCE

Sample Site: **DEK Bottom Ash Pond**
Field Sample ID: **DUP-DEK-BAP**
Lab Sample ID: 21-0528-05
Matrix: Groundwater

Laboratory Project: **21-0528**
Collect Date: 05/03/2021
Collect Time: 12:00 AM

Mercury by EPA 7470A, Total, Aqueous

Aliquot: 21-0528-05-C01-A01

Analyst: TMR

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Mercury	ND		ug/L	0.2	05/12/2021	AB21-0512-13

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

Aliquot: 21-0528-05-C01-A02

Analyst: EB

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Antimony	ND		ug/L	1	05/13/2021	AB21-0514-08
Arsenic	44		ug/L	1	05/13/2021	AB21-0514-08
Barium	170		ug/L	5	05/13/2021	AB21-0514-08
Beryllium	ND		ug/L	1	05/13/2021	AB21-0514-08
Boron	948		ug/L	20	05/13/2021	AB21-0514-08
Cadmium	ND		ug/L	0.2	05/13/2021	AB21-0514-08
Calcium	97600		ug/L	1000	05/14/2021	AB21-0514-08
Chromium	ND		ug/L	1	05/13/2021	AB21-0514-08
Cobalt	ND		ug/L	6	05/13/2021	AB21-0514-08
Copper	ND		ug/L	1	05/13/2021	AB21-0514-08
Iron	418		ug/L	20	05/13/2021	AB21-0514-08
Lead	ND		ug/L	1	05/13/2021	AB21-0514-08
Lithium	39		ug/L	10	05/13/2021	AB21-0514-08
Magnesium	14700		ug/L	1000	05/14/2021	AB21-0514-08
Molybdenum	8		ug/L	5	05/13/2021	AB21-0514-08
Nickel	3		ug/L	2	05/13/2021	AB21-0514-08
Potassium	6790		ug/L	100	05/14/2021	AB21-0514-08
Selenium	1		ug/L	1	05/13/2021	AB21-0514-08
Silver	ND		ug/L	0.2	05/13/2021	AB21-0514-08
Sodium	73300		ug/L	1000	05/14/2021	AB21-0514-08
Thallium	ND		ug/L	2	05/13/2021	AB21-0514-08
Vanadium	ND		ug/L	2	05/13/2021	AB21-0514-08
Zinc	ND		ug/L	10	05/13/2021	AB21-0514-08

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

Aliquot: 21-0528-05-C02-A01

Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Chloride	65100		ug/L	1000	05/06/2021	AB21-0506-07
Fluoride	ND		ug/L	1000	05/06/2021	AB21-0506-07
Sulfate	50200		ug/L	1000	05/06/2021	AB21-0506-07

Total Dissolved Solids by SM 2540C

Aliquot: 21-0528-05-C03-A01

Analyst: CET

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Total Dissolved Solids	561		mg/L	10	05/07/2021	AB21-0507-02



Analytical Report

Report Date: 05/23/21

Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **DEK Bottom Ash Pond**
Field Sample ID: **DUP-DEK-BAP**
Lab Sample ID: 21-0528-05
Matrix: Groundwater

Laboratory Project: **21-0528**
Collect Date: 05/03/2021
Collect Time: 12:00 AM

Alkalinity by SM 2320B

Aliquot: 21-0528-05-C04-A01

Analyst: DLS

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Alkalinity Total	315000		ug/L	10000	05/11/2021	AB21-0511-11
Alkalinity Bicarbonate	315000		ug/L	10000	05/11/2021	AB21-0511-11
Alkalinity Carbonate	ND		ug/L	10000	05/11/2021	AB21-0511-11

Laboratory Services
A CENTURY OF EXCELLENCE

Sample Site: **DEK Bottom Ash Pond**
 Field Sample ID: **FB-DEK-BAP**
 Lab Sample ID: 21-0528-06
 Matrix: Water

Laboratory Project: **21-0528**
 Collect Date: 05/03/2021
 Collect Time: 11:35 AM

Mercury by EPA 7470A, Total, Aqueous

Aliquot: 21-0528-06-C01-A01

Analyst: TMR

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Mercury	ND		ug/L	0.2	05/12/2021	AB21-0512-13

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

Aliquot: 21-0528-06-C01-A02

Analyst: EB

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Antimony	ND		ug/L	1	05/13/2021	AB21-0514-08
Arsenic	ND		ug/L	1	05/13/2021	AB21-0514-08
Barium	ND		ug/L	5	05/13/2021	AB21-0514-08
Beryllium	ND		ug/L	1	05/13/2021	AB21-0514-08
Boron	ND		ug/L	20	05/13/2021	AB21-0514-08
Cadmium	ND		ug/L	0.2	05/13/2021	AB21-0514-08
Calcium	ND		ug/L	1000	05/14/2021	AB21-0514-08
Chromium	ND		ug/L	1	05/13/2021	AB21-0514-08
Cobalt	ND		ug/L	6	05/13/2021	AB21-0514-08
Copper	1		ug/L	1	05/13/2021	AB21-0514-08
Iron	ND		ug/L	20	05/13/2021	AB21-0514-08
Lead	ND		ug/L	1	05/13/2021	AB21-0514-08
Lithium	ND		ug/L	10	05/13/2021	AB21-0514-08
Magnesium	ND		ug/L	1000	05/14/2021	AB21-0514-08
Molybdenum	ND		ug/L	5	05/13/2021	AB21-0514-08
Nickel	ND		ug/L	2	05/13/2021	AB21-0514-08
Potassium	ND		ug/L	100	05/14/2021	AB21-0514-08
Selenium	ND		ug/L	1	05/13/2021	AB21-0514-08
Silver	ND		ug/L	0.2	05/13/2021	AB21-0514-08
Sodium	ND		ug/L	1000	05/14/2021	AB21-0514-08
Thallium	ND		ug/L	2	05/13/2021	AB21-0514-08
Vanadium	ND		ug/L	2	05/13/2021	AB21-0514-08
Zinc	ND		ug/L	10	05/13/2021	AB21-0514-08

Data Qualifiers	Exception Summary
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No exceptions occurred.

TITLE: SAMPLE LOG-IN – SHIPMENT INSPECTION FORM

Project Log-In Number: 21-0528

Inspection Date: 05/05/21 Inspection By: CVH

Sample Origin/Project Name: BAP DEK

Shipment Delivered By: Enter the type of shipment carrier.

Pony _____ FedEx UPS _____ USPS _____ Airborne _____

Other/Hand Carry (whom) _____

Tracking Number: 786769790230 Shipping Form Attached: Yes No _____

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

Cooler (1) Cardboard Box _____ Custom Case _____ Envelope/Mailer _____

Loose/Unpackaged Containers _____ Other _____

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

Damaged Shipment Observed: None Dented _____ Leaking _____

Other _____

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

Shipping Containers Received: Opened _____ Sealed

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

CoC Work Request _____ Air Data Sheet _____ Other _____

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

As-Received Temperature Range 0.2 - 1.4°C Samples Received on Ice: Yes No _____

M&TE # and Expiration 05402
6.4.21

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

Container Type	Water	Soil	Other	Broken	Leaking
VOA (40mL or 60mL)	<u>10</u>	_____	_____	_____	_____
Quart/Liter (g/p)	_____	_____	_____	_____	_____
9-oz (amber glass jar)	_____	_____	_____	_____	_____
2-oz (amber glass)	_____	_____	_____	_____	_____
125 mL (plastic)	<u>11+1=12</u>	_____	_____	_____	_____
24 mL vial (glass)	_____	_____	_____	_____	_____
50 500 mL (plastic)	<u>5</u>	_____	_____	_____	_____
Other	_____	_____	_____	_____	_____

CHAIN OF CUSTODY



CONSUMERS ENERGY COMPANY – LABORATORY SERVICES

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

SAMPLING SITE				PROJECT NUMBER			ANALYSIS REQUESTED						Page 1 of 1			
DEK Bottom Ash Pond – 2021 Q2				21-0528			Total Metals	Anions	TDS	Alkalinity	DISSOLVED METALS			SEND REPORT TO CDBatts		
SAMPLING TEAM TRC				DATE SHIPPED 5/4/21		SITE SKETCHED ATTACHED? CIRCLE ONE								HD Register, TRC		
				YES NO										PHONE _____		
CE CONTROL #	SAMPLE DATE	SAMPLE TIME	SAMPLE MATRIX	SAMPLE DESCRIPTION / LOCATION	DEPTH (ft)	# OF CONTAINERS								REMARKS		
21-0528-01	5/3/21	13:08	GW	DEK-MW-15002		5	X	X	X	X	X					
-02	5/3/21	14:10	GW	DEK-MW-15004		5	X	X	X	X						
-03	5/3/21	11:35	GW	DEK-MW-15005		5	X	X	X	X						
-04	5/3/21	10:25	GW	DEK-MW-15006		5	X	X	X	X						
-05	5/3/21		W	DUP-DEK-BAP		5	X	X	X	X						
-06	5/3/21	11:35	W	FB-DEK-BAP		1	X									
RELINQUISHED BY (SIGNATURE)				DATE/TIME		RECEIVED BY (SIGNATURE)		COMMENTS 0.2-1.40 0.15402								
				5-4-21 / 1630		Fedex										
RELINQUISHED BY (SIGNATURE)				DATE/TIME		RECEIVED BY (SIGNATURE)		ORIGINAL TO LAB COPY TO CUSTOMER								
Fed ex				5.5.21 1100												

To: CDBatts, Karn/Weadock

From: EBlaj, T-258

Date: May 23, 2021

Subject: RCRA GROUNDWATER MONITORING – KARN BAP & LINED IMP. WELLS – 2021 Q2

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

Darby Litz, Project Manager
TRC Companies, Inc.
1540 Eisenhower Place
Ann Arbor, MI 48108

Chemistry Project: 21-0529

TRC Environmental, Inc. conducted groundwater monitoring at the DEKarn Bottom Ash Pond and Lined Impoundment Wells area on 05/03/2021, for the 2nd Quarter monitoring requirement, as specified in the Sampling and Analysis Plan for the site. The samples were received for analysis by the Chemistry department of Laboratory Services on 05/05/2021.

The report that follows presents the results of the requested analytical testing; the results apply only to the samples as received. All samples have been analyzed in accordance with the 2016 TNI Standard and the applicable A2LA accreditation scope for Laboratory Services. Any exceptions to applicable test method criteria and standard compliance are noted in the Case Narrative, or flagged with applicable qualifiers in the analytical results section.

Reviewed and approved by:

Emil Blaj
Sr. Technical Analyst
Project Lead



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

CASE NARRATIVE

I. Sample Receipt

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

II. Methodology

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

III. Results/Quality Control

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

DEFINITIONS / QUALIFIERS

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

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

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

Customer Name: Karn/Weadock Complex

Work Order ID: Q2-2021 DEK RCRA Bottom Ash Pond & Lined Impoundment

Date Received: 5/5/2021

Chemistry Project: 21-0529

<u>Sample #</u>	<u>Field Sample ID</u>	<u>Matrix</u>	<u>Sample Date</u>	<u>Site</u>
21-0529-01	DEK-MW-15003	Groundwater	05/03/2021 12:33 PM	DEK Bottom Ash Pond & Lined Impoundment
21-0529-02	DEK-MW-18001	Groundwater	05/03/2021 11:28 AM	DEK Bottom Ash Pond & Lined Impoundment
21-0529-03	DEK-MW-18001 MS	Groundwater	05/03/2021 11:28 AM	DEK Bottom Ash Pond & Lined Impoundment
21-0529-04	DEK-MW-18001 MSD	Groundwater	05/03/2021 11:28 AM	DEK Bottom Ash Pond & Lined Impoundment



Analytical Report

Report Date: 05/23/21

Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **DEK Bottom Ash Pond & Lined Impoundment**
 Field Sample ID: **DEK-MW-15003**
 Lab Sample ID: 21-0529-01
 Matrix: Groundwater

Laboratory Project: **21-0529**
 Collect Date: 05/03/2021
 Collect Time: 12:33 PM

Mercury by EPA 7470A, Total, Aqueous

Aliquot: 21-0529-01-C01-A01

Analyst: TMR

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Mercury	ND		ug/L	0.1	05/12/2021	AB21-0512-13

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

Aliquot: 21-0529-01-C01-A02

Analyst: EB

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Antimony	ND		ug/L	1	05/13/2021	AB21-0514-08
Arsenic	545		ug/L	1	05/13/2021	AB21-0514-08
Barium	42		ug/L	5	05/13/2021	AB21-0514-08
Beryllium	ND		ug/L	1	05/13/2021	AB21-0514-08
Boron	862		ug/L	20	05/13/2021	AB21-0514-08
Cadmium	ND		ug/L	0.2	05/13/2021	AB21-0514-08
Calcium	27400		ug/L	1000	05/14/2021	AB21-0514-08
Chromium	ND		ug/L	1	05/13/2021	AB21-0514-08
Cobalt	ND		ug/L	6	05/13/2021	AB21-0514-08
Copper	ND		ug/L	1	05/13/2021	AB21-0514-08
Iron	141		ug/L	20	05/13/2021	AB21-0514-08
Lead	ND		ug/L	1	05/13/2021	AB21-0514-08
Lithium	20		ug/L	10	05/13/2021	AB21-0514-08
Magnesium	4330		ug/L	1000	05/14/2021	AB21-0514-08
Molybdenum	25		ug/L	5	05/13/2021	AB21-0514-08
Nickel	ND		ug/L	2	05/13/2021	AB21-0514-08
Potassium	4470		ug/L	100	05/14/2021	AB21-0514-08
Selenium	1		ug/L	1	05/13/2021	AB21-0514-08
Silver	ND		ug/L	0.2	05/13/2021	AB21-0514-08
Sodium	46900		ug/L	1000	05/14/2021	AB21-0514-08
Thallium	ND		ug/L	2	05/13/2021	AB21-0514-08
Vanadium	ND		ug/L	2	05/13/2021	AB21-0514-08
Zinc	ND		ug/L	10	05/13/2021	AB21-0514-08

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

Aliquot: 21-0529-01-C02-A01

Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Chloride	50600		ug/L	1000	05/06/2021	AB21-0506-07
Fluoride	ND		ug/L	1000	05/06/2021	AB21-0506-07
Sulfate	32500		ug/L	1000	05/06/2021	AB21-0506-07

Total Dissolved Solids by SM 2540C

Aliquot: 21-0529-01-C03-A01

Analyst: CET

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Total Dissolved Solids	246		mg/L	10	05/07/2021	AB21-0507-02



Analytical Report

Report Date: 05/23/21

Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **DEK Bottom Ash Pond & Lined Impoundment**
Field Sample ID: **DEK-MW-15003**
Lab Sample ID: 21-0529-01
Matrix: Groundwater

Laboratory Project: **21-0529**
Collect Date: 05/03/2021
Collect Time: 12:33 PM

Alkalinity by SM 2320B

Aliquot: 21-0529-01-C04-A01

Analyst: DLS

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Alkalinity Total	86200		ug/L	10000	05/11/2021	AB21-0511-11
Alkalinity Bicarbonate	86200		ug/L	10000	05/11/2021	AB21-0511-11
Alkalinity Carbonate	ND		ug/L	10000	05/11/2021	AB21-0511-11



Analytical Report

Report Date: 05/23/21

Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **DEK Bottom Ash Pond & Lined Impoundment**
 Field Sample ID: **DEK-MW-18001**
 Lab Sample ID: 21-0529-02
 Matrix: Groundwater

Laboratory Project: **21-0529**
 Collect Date: 05/03/2021
 Collect Time: 11:28 AM

Mercury by EPA 7470A, Total, Aqueous

Aliquot: 21-0529-02-C01-A01

Analyst: TMR

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Mercury	ND		ug/L	0.2	05/12/2021	AB21-0512-13

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

Aliquot: 21-0529-02-C01-A02

Analyst: EB

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Antimony	ND		ug/L	1	05/13/2021	AB21-0514-08
Arsenic	92		ug/L	1	05/13/2021	AB21-0514-08
Barium	135		ug/L	5	05/13/2021	AB21-0514-08
Beryllium	ND		ug/L	1	05/13/2021	AB21-0514-08
Boron	1180		ug/L	20	05/13/2021	AB21-0514-08
Cadmium	ND		ug/L	0.2	05/13/2021	AB21-0514-08
Calcium	65200		ug/L	1000	05/14/2021	AB21-0514-08
Chromium	ND		ug/L	1	05/13/2021	AB21-0514-08
Cobalt	ND		ug/L	6	05/13/2021	AB21-0514-08
Copper	ND		ug/L	1	05/13/2021	AB21-0514-08
Iron	761		ug/L	20	05/13/2021	AB21-0514-08
Lead	ND		ug/L	1	05/13/2021	AB21-0514-08
Lithium	25		ug/L	10	05/13/2021	AB21-0514-08
Magnesium	12300		ug/L	1000	05/14/2021	AB21-0514-08
Molybdenum	ND		ug/L	5	05/13/2021	AB21-0514-08
Nickel	ND		ug/L	2	05/13/2021	AB21-0514-08
Potassium	4180		ug/L	100	05/14/2021	AB21-0514-08
Selenium	ND		ug/L	1	05/13/2021	AB21-0514-08
Silver	ND		ug/L	0.2	05/13/2021	AB21-0514-08
Sodium	69700		ug/L	1000	05/14/2021	AB21-0514-08
Thallium	ND		ug/L	2	05/13/2021	AB21-0514-08
Vanadium	ND		ug/L	2	05/13/2021	AB21-0514-08
Zinc	ND		ug/L	10	05/13/2021	AB21-0514-08

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

Aliquot: 21-0529-02-C02-A01

Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Chloride	51600		ug/L	1000	05/07/2021	AB21-0506-07
Fluoride	ND		ug/L	1000	05/07/2021	AB21-0506-07
Sulfate	121000		ug/L	1000	05/07/2021	AB21-0506-07

Total Dissolved Solids by SM 2540C

Aliquot: 21-0529-02-C03-A01

Analyst: CET

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Total Dissolved Solids	486		mg/L	10	05/07/2021	AB21-0507-02



Analytical Report

Report Date: 05/23/21

Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **DEK Bottom Ash Pond & Lined Impoundment**
Field Sample ID: **DEK-MW-18001**
Lab Sample ID: 21-0529-02
Matrix: Groundwater

Laboratory Project: **21-0529**
Collect Date: 05/03/2021
Collect Time: 11:28 AM

Alkalinity by SM 2320B

Aliquot: 21-0529-02-C04-A01

Analyst: DLS

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Alkalinity Total	191000		ug/L	10000	05/11/2021	AB21-0511-11
Alkalinity Bicarbonate	191000		ug/L	10000	05/11/2021	AB21-0511-11
Alkalinity Carbonate	ND		ug/L	10000	05/11/2021	AB21-0511-11



Analytical Report

Report Date: 05/23/21

Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **DEK Bottom Ash Pond & Lined Impoundment**
 Field Sample ID: **DEK-MW-18001 MS**
 Lab Sample ID: 21-0529-03
 Matrix: Groundwater

Laboratory Project: **21-0529**
 Collect Date: 05/03/2021
 Collect Time: 11:28 AM

Mercury by EPA 7470A, Total, Aqueous

Aliquot: 21-0529-03-C01-A01

Analyst: TMR

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Mercury	99.8		%	0.2	05/12/2021	AB21-0512-13

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

Aliquot: 21-0529-03-C01-A02

Analyst: EB

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Antimony	108		%	1	05/13/2021	AB21-0514-08
Arsenic	117		%	1	05/13/2021	AB21-0514-08
Barium	109		%	5	05/13/2021	AB21-0514-08
Beryllium	113		%	1	05/13/2021	AB21-0514-08
Boron	115		%	20	05/13/2021	AB21-0514-08
Cadmium	104		%	0.2	05/13/2021	AB21-0514-08
Calcium	123		%	1000	05/14/2021	AB21-0514-08
Chromium	98		%	1	05/13/2021	AB21-0514-08
Cobalt	104		%	6	05/13/2021	AB21-0514-08
Copper	98		%	1	05/13/2021	AB21-0514-08
Iron	88		%	20	05/13/2021	AB21-0514-08
Lead	103		%	1	05/13/2021	AB21-0514-08
Lithium	110		%	10	05/13/2021	AB21-0514-08
Magnesium	112		%	1000	05/14/2021	AB21-0514-08
Molybdenum	114		%	5	05/13/2021	AB21-0514-08
Nickel	97		%	2	05/13/2021	AB21-0514-08
Potassium	117		%	100	05/14/2021	AB21-0514-08
Selenium	118		%	1	05/13/2021	AB21-0514-08
Silver	104		%	0.2	05/13/2021	AB21-0514-08
Sodium	117		%	1000	05/14/2021	AB21-0514-08
Thallium	102		%	2	05/13/2021	AB21-0514-08
Vanadium	101		%	2	05/13/2021	AB21-0514-08
Zinc	101		%	10	05/13/2021	AB21-0514-08

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

Aliquot: 21-0529-03-C02-A01

Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Chloride	117		%	1000	05/07/2021	AB21-0506-07
Fluoride	90		%	1000	05/07/2021	AB21-0506-07
Sulfate	102		%	1000	05/07/2021	AB21-0506-07

Alkalinity by SM 2320B

Aliquot: 21-0529-03-C03-A01

Analyst: DLS

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Alkalinity Total	97		%	10000	05/11/2021	AB21-0511-11



Analytical Report

Report Date: 05/23/21

Laboratory Services A CENTURY OF EXCELLENCE

Sample Site: **DEK Bottom Ash Pond & Lined Impoundment**
Field Sample ID: **DEK-MW-18001 MSD**
Lab Sample ID: 21-0529-04
Matrix: Groundwater

Laboratory Project: **21-0529**
Collect Date: 05/03/2021
Collect Time: 11:28 AM

Mercury by EPA 7470A, Total, Aqueous

Aliquot: 21-0529-04-C01-A01

Analyst: TMR

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Mercury	100.0		%	0.2	05/12/2021	AB21-0512-13

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

Aliquot: 21-0529-04-C01-A02

Analyst: EB

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Antimony	110		%	1	05/13/2021	AB21-0514-08
Arsenic	118		%	1	05/13/2021	AB21-0514-08
Barium	112		%	5	05/13/2021	AB21-0514-08
Beryllium	113		%	1	05/13/2021	AB21-0514-08
Boron	106		%	20	05/13/2021	AB21-0514-08
Cadmium	105		%	0.2	05/13/2021	AB21-0514-08
Calcium	121		%	1000	05/14/2021	AB21-0514-08
Chromium	97		%	1	05/13/2021	AB21-0514-08
Cobalt	104		%	6	05/13/2021	AB21-0514-08
Copper	97		%	1	05/13/2021	AB21-0514-08
Iron	91		%	20	05/13/2021	AB21-0514-08
Lead	102		%	1	05/13/2021	AB21-0514-08
Lithium	108		%	10	05/13/2021	AB21-0514-08
Magnesium	114		%	1000	05/14/2021	AB21-0514-08
Molybdenum	115		%	5	05/13/2021	AB21-0514-08
Nickel	96		%	2	05/13/2021	AB21-0514-08
Potassium	114		%	100	05/14/2021	AB21-0514-08
Selenium	115		%	1	05/13/2021	AB21-0514-08
Silver	104		%	0.2	05/13/2021	AB21-0514-08
Sodium	121		%	1000	05/14/2021	AB21-0514-08
Thallium	102		%	2	05/13/2021	AB21-0514-08
Vanadium	100		%	2	05/13/2021	AB21-0514-08
Zinc	100		%	10	05/13/2021	AB21-0514-08

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

Aliquot: 21-0529-04-C02-A01

Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Chloride	115		%	1000	05/07/2021	AB21-0506-07
Fluoride	94		%	1000	05/07/2021	AB21-0506-07
Sulfate	102		%	1000	05/07/2021	AB21-0506-07

Alkalinity by SM 2320B

Aliquot: 21-0529-04-C03-A01

Analyst: DLS

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Alkalinity Total	96		%	10000	05/11/2021	AB21-0511-11

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

No exceptions occurred.

TITLE: SAMPLE LOG-IN – SHIPMENT INSPECTION FORM

Project Log-In Number: 21-0529

Inspection Date: 5/5/21 Inspection By: LVH

Sample Origin/Project Name: DEK BAP + LI

Shipment Delivered By: Enter the type of shipment carrier.

Pony _____ FedEx UPS _____ USPS _____ Airborne _____

Other/Hand Carry (whom) _____

Tracking Number: 786749796241 Shipping Form Attached: Yes No _____

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

Cooler (1) Cardboard Box _____ Custom Case _____ Envelope/Mailer _____

Loose/Unpackaged Containers _____ Other _____

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

Damaged Shipment Observed: None Dented _____ Leaking _____

Other _____

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

Shipping Containers Received: Opened _____ Sealed

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

CoC Work Request _____ Air Data Sheet _____ Other _____

Temperature of Containers: Measure the temperature of several sample containers

As-Received Temperature Range 0.3 - 1.6 °C Samples Received on Ice: Yes No _____

M&TE # and Expiration 015402

4.4.21

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

Container Type	Water	Soil	Other	Broken	Leaking
VOA (40mL or <u>60mL</u>)	<u>8</u>	_____	_____	_____	_____
Quart/Liter (g/p)	_____	_____	_____	_____	_____
9-oz (amber glass jar)	_____	_____	_____	_____	_____
2-oz (amber glass)	_____	_____	_____	_____	_____
125 mL (plastic)	<u>8</u>	_____	_____	_____	_____
24 mL vial (glass)	_____	_____	_____	_____	_____
<u>250</u> 200 mL (plastic)	<u>2</u>	_____	_____	_____	_____
Other _____	_____	_____	_____	_____	_____

CHAIN OF CUSTODY

CONSUMERS ENERGY COMPANY – LABORATORY SERVICES



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

SAMPLING SITE				PROJECT NUMBER			ANALYSIS REQUESTED							Page 1 of 1	
DEK Bottom Ash Pond & LI – 2021 Q2				21-0529			Total Metals	Anions	TDS	Alkalinity					SEND REPORT TO CDBatts
SAMPLING TEAM				DATE SHIPPED	SITE SKETCHED ATTACHED? CIRCLE ONE										
TRC				5-4-21	YES NO									PHONE _____	
CE CONTROL #	SAMPLE DATE	SAMPLE TIME	SAMPLE MATRIX	SAMPLE DESCRIPTION / LOCATION	DEPTH (ft)	# OF CONTAINERS									
21-0529-01	5-3-21	1233	GW	DEK-MW-15003		5	X	X	X	X					
↓	-02	5-3-21	1128	GW	DEK-MW-18001		5	X	X	X	X				
	-03	5-3-21	1128	GW	DEK-MW-18001 MS		4	X	X		X				
↓	-04	5-3-21	1128	GW	DEK-MW-18001 MSD		4	X	X		X				
RELINQUISHED BY (SIGNATURE)				DATE/TIME		RECEIVED BY (SIGNATURE)		COMMENTS 8-3-16°C 015402 ORIGINAL TO LAB COPY TO CUSTOMER							
				5-4-21 / 1630		Fedex									
RELINQUISHED BY (SIGNATURE)				DATE/TIME		RECEIVED BY (SIGNATURE)									
Fed Ex				5-5-21 1100		(A. Senff Hansen)									

ANALYTICAL REPORT

Eurofins TestAmerica, Canton
4101 Shuffel Street NW
North Canton, OH 44720
Tel: (330)497-9396

Laboratory Job ID: 240-149188-1

Client Project/Site: Karn/Weadock CCR Background Wells

For:

TRC Environmental Corporation.
1540 Eisenhower Place
Ann Arbor, Michigan 48108-7080

Attn: Darby Litz



*Authorized for release by:
6/17/2021 12:48:02 PM*

Kris Brooks, Project Manager II
(330)966-9790
Kris.Brooks@Eurofinset.com

LINKS

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results through
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www.eurofinsus.com/Env

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

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



Table of Contents

Cover Page	1
Table of Contents	2
Definitions/Glossary	3
Case Narrative	4
Method Summary	6
Sample Summary	7
Client Sample Results	8
Tracer Carrier Summary	14
QC Sample Results	15
QC Association Summary	17
Lab Chronicle	18
Certification Summary	20
Chain of Custody	21
Receipt Checklists	25

Definitions/Glossary

Client: TRC Environmental Corporation.
Project/Site: Karn/Weadock CCR Background Wells

Job ID: 240-149188-1

Qualifiers

Rad

Qualifier	Qualifier Description
U	Result is less than the sample detection limit.

Glossary

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

Case Narrative

Client: TRC Environmental Corporation.
Project/Site: Karn/Weadock CCR Background Wells

Job ID: 240-149188-1

Job ID: 240-149188-1

Laboratory: Eurofins TestAmerica, Canton

Narrative

Job Narrative 240-149188-1

Comments

The EPA Method 904.0 Radium-228, EPA Method 903.0 Radium-226, and Ra226_Ra228 Combined Radium 226 and Radium 228 analyses were performed at the Eurofins TestAmerica St. Louis laboratory.

Receipt

The samples were received on 5/12/2021 8:00 AM. Unless otherwise noted below, the samples arrived in good condition, and where required, properly preserved and on ice. The temperature of the cooler at receipt was 0.6° C.

RAD

Method 903.0: Radium 226 prep batch 160-510304

Any minimum detectable concentration (MDC), critical value (DLC), or Safe Drinking Water Act detection limit (SDWA DL) is sample-specific unless otherwise stated elsewhere in this narrative. Radiochemistry sample results are reported with the count date/time applied as the Activity Reference Date. MW-15002 (240-149188-1), MW-15008 (240-149188-2), MW-15016 (240-149188-3), MW-15019 (240-149188-4), DUP-BACKGROUND (240-149188-5), FB-BACKGROUND (240-149188-6), (LCS 160-510304/1-A), (LCSD 160-510304/2-A) and (MB 160-510304/22-A)

Method 904.0: Radium-228 Batch 510305

Any minimum detectable concentration (MDC), critical value (DLC), or Safe Drinking Water Act detection limit (SDWA DL) is sample-specific unless otherwise stated elsewhere in this narrative. Radiochemistry sample results are reported with the count date/time applied as the Activity Reference Date. MW-15002 (240-149188-1), MW-15008 (240-149188-2), MW-15016 (240-149188-3), MW-15019 (240-149188-4), DUP-BACKGROUND (240-149188-5), FB-BACKGROUND (240-149188-6), (LCS 160-510305/1-A), (LCSD 160-510305/2-A) and (MB 160-510305/22-A)

Method PrecSep_0:

Method PrecSep_0: Ra-228 Batch 160-510305:

Insufficient sample volume was available to perform a sample duplicate (DUP) for the following samples: MW-15016 (240-149188-3) and FB-BACKGROUND (240-149188-6). A laboratory control sample/ laboratory control sample duplicate (LCS/LCSD) were prepared instead to demonstrate batch precision.

Method PrecSep_0: Ra-228 Batch 160-510305:

The following samples were prepared at a reduced aliquot due to Matrix: MW-15002 (240-149188-1), MW-15008 (240-149188-2), MW-15019 (240-149188-4) and DUP-BACKGROUND (240-149188-5). A laboratory control sample/ laboratory control sample duplicate (LCS/LCSD) were prepared instead of a sample duplicate (DUP) to demonstrate batch precision.

Method PrecSep STD:

Method PrecSep STD: Ra-226 Batch 160-510304:

Insufficient sample volume was available to perform a sample duplicate (DUP) for the following samples: MW-15016 (240-149188-3) and FB-BACKGROUND (240-149188-6). A laboratory control sample/ laboratory control sample duplicate (LCS/LCSD) were prepared instead to demonstrate batch precision.

Method PrecSep STD: Ra-226 Batch 160-510304:

The following samples were prepared at a reduced aliquot due to Matrix: MW-15002 (240-149188-1), MW-15008 (240-149188-2), MW-15019 (240-149188-4) and DUP-BACKGROUND (240-149188-5). A laboratory control sample/ laboratory control sample duplicate (LCS/LCSD) were prepared instead of a sample duplicate (DUP) to demonstrate batch precision.

Case Narrative

Client: TRC Environmental Corporation.
Project/Site: Karn/Weadock CCR Background Wells

Job ID: 240-149188-1

Job ID: 240-149188-1 (Continued)

Laboratory: Eurofins TestAmerica, Canton (Continued)

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

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- 3
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- 14

Method Summary

Client: TRC Environmental Corporation.
Project/Site: Karn/Weadock CCR Background Wells

Job ID: 240-149188-1

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

Protocol References:

EPA = US Environmental Protection Agency

None = None

TAL-STL = TestAmerica Laboratories, St. Louis, Facility Standard Operating Procedure.

Laboratory References:

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

Sample Summary

Client: TRC Environmental Corporation.
Project/Site: Karn/Weadock CCR Background Wells

Job ID: 240-149188-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received	Asset ID
240-149188-1	MW-15002	Water	05/03/21 14:00	05/12/21 08:00	
240-149188-2	MW-15008	Water	05/03/21 15:56	05/12/21 08:00	
240-149188-3	MW-15016	Water	05/03/21 15:09	05/12/21 08:00	
240-149188-4	MW-15019	Water	05/03/21 16:03	05/12/21 08:00	
240-149188-5	DUP-BACKGROUND	Water	05/03/21 00:00	05/12/21 08:00	
240-149188-6	FB-BACKGROUND	Water	05/03/21 16:03	05/12/21 08:00	

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Client Sample Results

Client: TRC Environmental Corporation.
 Project/Site: Karn/Weadock CCR Background Wells

Job ID: 240-149188-1

Client Sample ID: MW-15002

Lab Sample ID: 240-149188-1

Date Collected: 05/03/21 14:00

Matrix: Water

Date Received: 05/12/21 08:00

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	1.24		0.315	0.334	1.00	0.274	pCi/L	05/18/21 13:46	06/14/21 21:14	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	75.4		40 - 110					05/18/21 13:46	06/14/21 21:14	1

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	2.49		0.578	0.622	1.00	0.689	pCi/L	05/18/21 14:33	06/11/21 14:07	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	75.4		40 - 110					05/18/21 14:33	06/11/21 14:07	1
Y Carrier	92.3		40 - 110					05/18/21 14:33	06/11/21 14:07	1

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

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	3.72		0.658	0.706	5.00	0.689	pCi/L		06/15/21 21:24	1

Client Sample Results

Client: TRC Environmental Corporation.
 Project/Site: Karn/Weadock CCR Background Wells

Job ID: 240-149188-1

Client Sample ID: MW-15008

Lab Sample ID: 240-149188-2

Date Collected: 05/03/21 15:56

Matrix: Water

Date Received: 05/12/21 08:00

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.127	U	0.177	0.177	1.00	0.298	pCi/L	05/18/21 13:46	06/14/21 21:18	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	72.1		40 - 110					05/18/21 13:46	06/14/21 21:18	1

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.677	U	0.453	0.457	1.00	0.699	pCi/L	05/18/21 14:33	06/11/21 14:08	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	72.1		40 - 110					05/18/21 14:33	06/11/21 14:08	1
Y Carrier	89.7		40 - 110					05/18/21 14:33	06/11/21 14:08	1

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

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.804		0.486	0.490	5.00	0.699	pCi/L		06/15/21 21:24	1

Client Sample Results

Client: TRC Environmental Corporation.
 Project/Site: Karn/Weadock CCR Background Wells

Job ID: 240-149188-1

Client Sample ID: MW-15016

Lab Sample ID: 240-149188-3

Date Collected: 05/03/21 15:09

Matrix: Water

Date Received: 05/12/21 08:00

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.0524	U	0.121	0.122	1.00	0.218	pCi/L	05/18/21 13:46	06/14/21 21:18	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	73.6		40 - 110					05/18/21 13:46	06/14/21 21:18	1

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.606		0.327	0.332	1.00	0.480	pCi/L	05/18/21 14:33	06/11/21 14:08	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	73.6		40 - 110					05/18/21 14:33	06/11/21 14:08	1
Y Carrier	84.5		40 - 110					05/18/21 14:33	06/11/21 14:08	1

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

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.658		0.349	0.354	5.00	0.480	pCi/L		06/15/21 21:24	1

Client Sample Results

Client: TRC Environmental Corporation.
 Project/Site: Karn/Weadock CCR Background Wells

Job ID: 240-149188-1

Client Sample ID: MW-15019

Lab Sample ID: 240-149188-4

Date Collected: 05/03/21 16:03

Matrix: Water

Date Received: 05/12/21 08:00

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.302	U	0.212	0.214	1.00	0.309	pCi/L	05/18/21 13:46	06/14/21 21:18	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	71.8		40 - 110					05/18/21 13:46	06/14/21 21:18	1

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.600	U	0.451	0.454	1.00	0.707	pCi/L	05/18/21 14:33	06/11/21 14:08	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	71.8		40 - 110					05/18/21 14:33	06/11/21 14:08	1
Y Carrier	89.3		40 - 110					05/18/21 14:33	06/11/21 14:08	1

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

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.902		0.498	0.502	5.00	0.707	pCi/L		06/15/21 21:24	1

Client Sample Results

Client: TRC Environmental Corporation.
 Project/Site: Karn/Weadock CCR Background Wells

Job ID: 240-149188-1

Client Sample ID: DUP-BACKGROUND

Lab Sample ID: 240-149188-5

Date Collected: 05/03/21 00:00

Matrix: Water

Date Received: 05/12/21 08:00

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	1.01		0.280	0.294	1.00	0.277	pCi/L	05/18/21 13:46	06/14/21 21:19	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	86.8		40 - 110					05/18/21 13:46	06/14/21 21:19	1

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	3.43		0.617	0.694	1.00	0.684	pCi/L	05/18/21 14:33	06/11/21 14:07	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	86.8		40 - 110					05/18/21 14:33	06/11/21 14:07	1
Y Carrier	88.2		40 - 110					05/18/21 14:33	06/11/21 14:07	1

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

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	4.44		0.678	0.754	5.00	0.684	pCi/L		06/15/21 21:24	1

Client Sample Results

Client: TRC Environmental Corporation.
 Project/Site: Karn/Weadock CCR Background Wells

Job ID: 240-149188-1

Client Sample ID: FB-BACKGROUND

Lab Sample ID: 240-149188-6

Date Collected: 05/03/21 16:03

Matrix: Water

Date Received: 05/12/21 08:00

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	-0.0247	U	0.0896	0.0897	1.00	0.187	pCi/L	05/18/21 13:46	06/14/21 21:19	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	88.3		40 - 110					05/18/21 13:46	06/14/21 21:19	1

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.206	U	0.284	0.285	1.00	0.474	pCi/L	05/18/21 14:33	06/11/21 13:57	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	88.3		40 - 110					05/18/21 14:33	06/11/21 13:57	1
Y Carrier	91.2		40 - 110					05/18/21 14:33	06/11/21 13:57	1

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

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.181	U	0.298	0.299	5.00	0.474	pCi/L		06/15/21 21:24	1

Tracer/Carrier Summary

Client: TRC Environmental Corporation.
 Project/Site: Karn/Weadock CCR Background Wells

Job ID: 240-149188-1

Method: 903.0 - Radium-226 (GFPC)

Matrix: Water

Prep Type: Total/NA

		Percent Yield (Acceptance Limits)	
Lab Sample ID	Client Sample ID	Ba (40-110)	
240-149188-1	MW-15002	75.4	
240-149188-2	MW-15008	72.1	
240-149188-3	MW-15016	73.6	
240-149188-4	MW-15019	71.8	
240-149188-5	DUP-BACKGROUND	86.8	
240-149188-6	FB-BACKGROUND	88.3	
LCS 160-510304/1-A	Lab Control Sample	82.0	
LCSD 160-510304/2-A	Lab Control Sample Dup	87.1	
MB 160-510304/22-A	Method Blank	86.8	
Tracer/Carrier Legend			
Ba = Ba Carrier			

Method: 904.0 - Radium-228 (GFPC)

Matrix: Water

Prep Type: Total/NA

		Percent Yield (Acceptance Limits)	
Lab Sample ID	Client Sample ID	Ba (40-110)	Y (40-110)
240-149188-1	MW-15002	75.4	92.3
240-149188-2	MW-15008	72.1	89.7
240-149188-3	MW-15016	73.6	84.5
240-149188-4	MW-15019	71.8	89.3
240-149188-5	DUP-BACKGROUND	86.8	88.2
240-149188-6	FB-BACKGROUND	88.3	91.2
LCS 160-510305/1-A	Lab Control Sample	82.0	89.3
LCSD 160-510305/2-A	Lab Control Sample Dup	87.1	90.5
MB 160-510305/22-A	Method Blank	86.8	84.9
Tracer/Carrier Legend			
Ba = Ba Carrier			
Y = Y Carrier			

QC Sample Results

Client: TRC Environmental Corporation.
 Project/Site: Karn/Weadock CCR Background Wells

Job ID: 240-149188-1

Method: 903.0 - Radium-226 (GFPC)

Lab Sample ID: MB 160-510304/22-A
Matrix: Water
Analysis Batch: 514296

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 510304

Analyte	MB		Count	Total	RL	MDC	Unit	Prepared		Analyzed		Dil Fac
	Result	MB Qualifier	Uncert. (2σ+/-)	Uncert. (2σ+/-)				05/18/21 13:46	06/15/21 07:09			
Radium-226	0.1200	U	0.103	0.104	1.00	0.156	pCi/L	05/18/21 13:46	06/15/21 07:09		1	
Carrier	MB		Limits					Prepared	Analyzed	Dil Fac		
Ba Carrier	%Yield	MB Qualifier	40 - 110					05/18/21 13:46	06/15/21 07:09	1		
	86.8											

Lab Sample ID: LCS 160-510304/1-A
Matrix: Water
Analysis Batch: 514248

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 510304

Analyte	LCS		Spike	LCS	Total	RL	MDC	Unit	%Rec	%Rec. Limits	
	Result	LCS Qual	Added	Result	Uncert. (2σ+/-)					75 - 125	
Radium-226	10.88		11.3	10.88	1.21	1.00	0.208	pCi/L	96	75 - 125	
Carrier	LCS		Limits								
Ba Carrier	%Yield	LCS Qualifier	40 - 110								
	82.0										

Lab Sample ID: LCSD 160-510304/2-A
Matrix: Water
Analysis Batch: 514248

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 510304

Analyte	LCSD		Spike	LCSD	Total	RL	MDC	Unit	%Rec	%Rec. Limits		RER	Limit
	Result	LCSD Qual	Added	Result	Uncert. (2σ+/-)					75 - 125	0.26	1	
Radium-226	11.52		11.3	11.52	1.25	1.00	0.163	pCi/L	102	75 - 125		0.26	1
Carrier	LCSD		Limits										
Ba Carrier	%Yield	LCSD Qualifier	40 - 110										
	87.1												

Method: 904.0 - Radium-228 (GFPC)

Lab Sample ID: MB 160-510305/22-A
Matrix: Water
Analysis Batch: 513770

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 510305

Analyte	MB		Count	Total	RL	MDC	Unit	Prepared		Analyzed		Dil Fac
	Result	MB Qualifier	Uncert. (2σ+/-)	Uncert. (2σ+/-)				05/18/21 14:33	06/11/21 14:18			
Radium-228	0.1192	U	0.255	0.256	1.00	0.439	pCi/L	05/18/21 14:33	06/11/21 14:18		1	
Carrier	MB		Limits					Prepared	Analyzed	Dil Fac		
Ba Carrier	%Yield	MB Qualifier	40 - 110					05/18/21 14:33	06/11/21 14:18	1		
Y Carrier	84.9		40 - 110					05/18/21 14:33	06/11/21 14:18	1		

QC Sample Results

Client: TRC Environmental Corporation.
 Project/Site: Karn/Weadock CCR Background Wells

Job ID: 240-149188-1

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

Lab Sample ID: LCS 160-510305/1-A
Matrix: Water
Analysis Batch: 513948

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 510305

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits	
									75	125
Radium-228	9.64	9.496		1.16	1.00	0.469	pCi/L	99	75	125
LCS LCS										
Carrier	%Yield	Qualifier	Limits							
Ba Carrier	82.0		40 - 110							
Y Carrier	89.3		40 - 110							

Lab Sample ID: LCSD 160-510305/2-A
Matrix: Water
Analysis Batch: 513948

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 510305

Analyte	Spike Added	LCSD Result	LCSD Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits		RER	Limit
									75	125	0.18	1
Radium-228	9.64	9.100		1.10	1.00	0.397	pCi/L	94	75	125	0.18	1
LCSD LCSD												
Carrier	%Yield	Qualifier	Limits									
Ba Carrier	87.1		40 - 110									
Y Carrier	90.5		40 - 110									

QC Association Summary

Client: TRC Environmental Corporation.
Project/Site: Karn/Weadock CCR Background Wells

Job ID: 240-149188-1

Rad

Prep Batch: 510304

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-149188-1	MW-15002	Total/NA	Water	PrecSep STD	
240-149188-2	MW-15008	Total/NA	Water	PrecSep STD	
240-149188-3	MW-15016	Total/NA	Water	PrecSep STD	
240-149188-4	MW-15019	Total/NA	Water	PrecSep STD	
240-149188-5	DUP-BACKGROUND	Total/NA	Water	PrecSep STD	
240-149188-6	FB-BACKGROUND	Total/NA	Water	PrecSep STD	
MB 160-510304/22-A	Method Blank	Total/NA	Water	PrecSep STD	
LCS 160-510304/1-A	Lab Control Sample	Total/NA	Water	PrecSep STD	
LCSD 160-510304/2-A	Lab Control Sample Dup	Total/NA	Water	PrecSep STD	

Prep Batch: 510305

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-149188-1	MW-15002	Total/NA	Water	PrecSep_0	
240-149188-2	MW-15008	Total/NA	Water	PrecSep_0	
240-149188-3	MW-15016	Total/NA	Water	PrecSep_0	
240-149188-4	MW-15019	Total/NA	Water	PrecSep_0	
240-149188-5	DUP-BACKGROUND	Total/NA	Water	PrecSep_0	
240-149188-6	FB-BACKGROUND	Total/NA	Water	PrecSep_0	
MB 160-510305/22-A	Method Blank	Total/NA	Water	PrecSep_0	
LCS 160-510305/1-A	Lab Control Sample	Total/NA	Water	PrecSep_0	
LCSD 160-510305/2-A	Lab Control Sample Dup	Total/NA	Water	PrecSep_0	

Lab Chronicle

Client: TRC Environmental Corporation.
Project/Site: Karn/Weadock CCR Background Wells

Job ID: 240-149188-1

Client Sample ID: MW-15002

Lab Sample ID: 240-149188-1

Date Collected: 05/03/21 14:00

Matrix: Water

Date Received: 05/12/21 08:00

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	PrecSep STD			510304	05/18/21 13:46	HRT	TAL SL
Total/NA	Analysis	903.0		1	514248	06/14/21 21:14	SCB	TAL SL
Total/NA	Prep	PrecSep_0			510305	05/18/21 14:33	MJ	TAL SL
Total/NA	Analysis	904.0		1	513948	06/11/21 14:07	ANW	TAL SL
Total/NA	Analysis	Ra226_Ra228		1	514477	06/15/21 21:24	GRW	TAL SL

Client Sample ID: MW-15008

Lab Sample ID: 240-149188-2

Date Collected: 05/03/21 15:56

Matrix: Water

Date Received: 05/12/21 08:00

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	PrecSep STD			510304	05/18/21 13:46	HRT	TAL SL
Total/NA	Analysis	903.0		1	514232	06/14/21 21:18	SCB	TAL SL
Total/NA	Prep	PrecSep_0			510305	05/18/21 14:33	MJ	TAL SL
Total/NA	Analysis	904.0		1	513948	06/11/21 14:08	ANW	TAL SL
Total/NA	Analysis	Ra226_Ra228		1	514477	06/15/21 21:24	GRW	TAL SL

Client Sample ID: MW-15016

Lab Sample ID: 240-149188-3

Date Collected: 05/03/21 15:09

Matrix: Water

Date Received: 05/12/21 08:00

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	PrecSep STD			510304	05/18/21 13:46	HRT	TAL SL
Total/NA	Analysis	903.0		1	514232	06/14/21 21:18	SCB	TAL SL
Total/NA	Prep	PrecSep_0			510305	05/18/21 14:33	MJ	TAL SL
Total/NA	Analysis	904.0		1	513948	06/11/21 14:08	ANW	TAL SL
Total/NA	Analysis	Ra226_Ra228		1	514477	06/15/21 21:24	GRW	TAL SL

Client Sample ID: MW-15019

Lab Sample ID: 240-149188-4

Date Collected: 05/03/21 16:03

Matrix: Water

Date Received: 05/12/21 08:00

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	PrecSep STD			510304	05/18/21 13:46	HRT	TAL SL
Total/NA	Analysis	903.0		1	514232	06/14/21 21:18	SCB	TAL SL
Total/NA	Prep	PrecSep_0			510305	05/18/21 14:33	MJ	TAL SL
Total/NA	Analysis	904.0		1	513948	06/11/21 14:08	ANW	TAL SL
Total/NA	Analysis	Ra226_Ra228		1	514477	06/15/21 21:24	GRW	TAL SL

Lab Chronicle

Client: TRC Environmental Corporation.
Project/Site: Karn/Weadock CCR Background Wells

Job ID: 240-149188-1

Client Sample ID: DUP-BACKGROUND

Lab Sample ID: 240-149188-5

Date Collected: 05/03/21 00:00

Matrix: Water

Date Received: 05/12/21 08:00

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	PrecSep STD			510304	05/18/21 13:46	HRT	TAL SL
Total/NA	Analysis	903.0		1	514232	06/14/21 21:19	SCB	TAL SL
Total/NA	Prep	PrecSep_0			510305	05/18/21 14:33	MJ	TAL SL
Total/NA	Analysis	904.0		1	513948	06/11/21 14:07	ANW	TAL SL
Total/NA	Analysis	Ra226_Ra228		1	514477	06/15/21 21:24	GRW	TAL SL

Client Sample ID: FB-BACKGROUND

Lab Sample ID: 240-149188-6

Date Collected: 05/03/21 16:03

Matrix: Water

Date Received: 05/12/21 08:00

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	PrecSep STD			510304	05/18/21 13:46	HRT	TAL SL
Total/NA	Analysis	903.0		1	514232	06/14/21 21:19	SCB	TAL SL
Total/NA	Prep	PrecSep_0			510305	05/18/21 14:33	MJ	TAL SL
Total/NA	Analysis	904.0		1	513943	06/11/21 13:57	ANW	TAL SL
Total/NA	Analysis	Ra226_Ra228		1	514477	06/15/21 21:24	GRW	TAL SL

Laboratory References:

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

Accreditation/Certification Summary

Client: TRC Environmental Corporation.
 Project/Site: Karn/Weadock CCR Background Wells


Job ID: 240-149188-1

Laboratory: Eurofins TestAmerica, St. Louis

All accreditations/certifications held by this laboratory are listed. Not all accreditations/certifications are applicable to this report.

Authority	Program	Identification Number	Expiration Date
Alaska (UST)	State	20-001	05-06-22
ANAB	Dept. of Defense ELAP	L2305	04-06-22
ANAB	Dept. of Energy	L2305.01	04-06-22
ANAB	ISO/IEC 17025	L2305	04-06-22
Arizona	State	AZ0813	12-08-21
California	Los Angeles County Sanitation Districts	10259	06-30-21
California	State	2886	06-30-21
Connecticut	State	PH-0241	03-31-23
Florida	NELAP	E87689	06-30-21
HI - RadChem Recognition	State	n/a	06-30-21
Illinois	NELAP	004553	11-30-21
Iowa	State	373	12-01-22
Kansas	NELAP	E-10236	10-31-21
Kentucky (DW)	State	KY90125	01-01-22
Kentucky (WW)	State	KY90125 (Permit KY0004049)	12-31-21
Louisiana	NELAP	04080	06-30-21
Louisiana (DW)	State	LA011	12-31-21
Maryland	State	310	09-30-21
MI - RadChem Recognition	State	9005	06-30-21
Missouri	State	780	06-30-22
Nevada	State	MO000542020-1	07-31-21
New Jersey	NELAP	MO002	06-30-21
New York	NELAP	11616	04-01-22
North Dakota	State	R-207	06-30-21
NRC	NRC	24-24817-01	12-31-22
Oklahoma	State	9997	08-31-21
Oregon	NELAP	4157	09-01-21
Pennsylvania	NELAP	68-00540	03-01-22
South Carolina	State	85002001	06-30-21
Texas	NELAP	T104704193	07-31-21
US Fish & Wildlife	US Federal Programs	058448	07-31-21
USDA	US Federal Programs	P330-17-00028	03-11-23
Utah	NELAP	MO000542019-11	07-31-21
Virginia	NELAP	10310	06-14-22
Washington	State	C592	08-30-21
West Virginia DEP	State	381	10-31-21

Chain of Custody Record 0-510-6

Client Information		Lab PM: Brooks, Kris M	Carrier Tracking No(s):	COC No: 240-82579-29047.1		
Client Contact: Jacob Krenz		E-Mail: Kris.Brooks@Eurofins.com	State of Origin:	Page: Page 1 of 1		
Company: TRC Environmental Corporation.		PWSID:	Job #:			
Address: 1540 Eisenhower Place		Due Date Requested:	Analysis Requested			
City: Ann Arbor		TAT Requested (days):	Total Number of Containers: <input checked="" type="checkbox"/>			
State, Zip: MI, 48108-7080		Compliance Project: <input type="checkbox"/> Yes <input type="checkbox"/> No	Preservation Codes: A - HCL B - NaOH C - Zn Acetate D - Nitric Acid E - NaHSO4 F - MeOH G - Amchlor H - Ascorbic Acid I - Ice J - DI Water K - EDTA L - EDA Other:			
Phone: 734-971-7080(Tel) 734-971-9022(Fax)		PO #:	M - Hexane N - None O - AsN2O2 P - Na2OAS Q - Na2SO3 R - Na2SO4 S - H2SO4 T - TSP Dodecahydrate U - Acetone V - MCAA W - pH 4-5 Z - other (specify)			
Email: JKrenz@trccompanies.com		WO #:	Special Instructions/Note:			
Project Name: Kaim/Weadock CCR Background Well		Project #:	 240-149188 Chain of Custody			
Site:		SSOW#:				
Sample Identification	Sample Date	Sample Time			Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=wastewater, B=sludge, A=AM)
MW-15002	5-3-21	1400			G	Water
MW-15008	5-3-21	1556			G	Water
MW-15016	5-3-21	1509			G	Water
MW-15019	5-3-21	1603			G	Water
FB-05 Dup-Background	5-3-21	—	G	Water		
FB-05 FB-Background	5-3-21	1603	G	Water		
Possible Hazard Identification <input checked="" type="checkbox"/> Non-Hazard <input type="checkbox"/> Flammable <input type="checkbox"/> Skin Irritant <input type="checkbox"/> Poison B <input type="checkbox"/> Unknown <input type="checkbox"/> Radiological						
Deliverable Requested: I, II, III, IV, Other (specify)						
Empty Kit Relinquished by:						
Relinquished by: <i>Jacob Krenz</i>		Date: 5-7-21/1538	Sample Disposal (A fee may be assessed if samples are retained longer than 1 month) <input type="checkbox"/> Return To Client <input type="checkbox"/> Disposal By Lab <input type="checkbox"/> Archive For _____ Months			
Relinquished by: <i>Ledy Mar</i>		Date: 5/7/21 1545	Special Instructions/QC Requirements:			
Relinquished by: <i>Ledy Mar - cold storage</i>		Date: 5/7/21 1545	Method of Shipment:			
Custody Seals Intact: <input type="checkbox"/> Yes <input type="checkbox"/> No		Received by: <i>Ledy Mar</i>		Date/Time: 5/7/21 1545		
Custody Seal No.:		Received by: <i>Mar</i>		Date/Time: 5-12-21 300		
		Received by:		Date/Time:		
		Company: TRC		Company: ETA		
		Company: ETA		Company: ETA		
		Company: Company		Company: Company		
Cooler Temperature(s) °C and Other Remarks:						

Eurofins TestAmerica Canton Sample Receipt Form/Narrative
Canton Facility


Login # : _____

Client TRC Site Name _____
 Cooler Received on 5-12-21 Opened on 5-12-21
 FedEx: 1st Grd Exp UPS FAS ~~Clipper~~ Client Drop Off TestAmerica Courier Other _____

Cooler unpacked by:
Matts

Receipt After-hours: Drop-off Date/Time _____ Storage Location _____

TestAmerica Cooler # 10 Foam Box Client Cooler Box Other _____
 Packing material used: Bubble Wrap Foam Plastic Bag None Other _____
 COOLANT: Wet Ice Blue Ice Dry Ice Water None

1. Cooler temperature upon receipt See Multiple Cooler Form
 IR GUN# IR-11 (CF +0.1 °C) Observed Cooler Temp. 0.5 °C Corrected Cooler Temp. 0.6 °C
 IR GUN #IR-12 (CF +0.2 °C) Observed Cooler Temp. _____ °C Corrected Cooler Temp. _____ °C
2. Were tamper/custody seals on the outside of the cooler(s)? If Yes Quantity 1 Yes No
 -Were the seals on the outside of the cooler(s) signed & dated? Yes No NA
 -Were tamper/custody seals on the bottle(s) or bottle kits (LLHg/MeHg)? Yes No NA
 -Were tamper/custody seals intact and uncompromised? Yes No NA
3. Shippers' packing slip attached to the cooler(s)? Yes No
4. Did custody papers accompany the sample(s)? Yes No
5. Were the custody papers relinquished & signed in the appropriate place? Yes No
6. Was/were the person(s) who collected the samples clearly identified on the COC? Yes No
7. Did all bottles arrive in good condition (Unbroken)? Yes No
8. Could all bottle labels (ID/Date/Time) be reconciled with the COC? Yes No
9. For each sample, does the COC specify preservatives (Y/N), # of containers (Y/N), and sample type of grab/comp (Y/N)? Yes No
10. Were correct bottle(s) used for the test(s) indicated? Yes No
11. Sufficient quantity received to perform indicated analyses? Yes No
12. Are these work share samples and all listed on the COC? Yes No
 If yes, Questions 13-17 have been checked at the originating laboratory.
13. Were all preserved sample(s) at the correct pH upon receipt? Yes No NA pH Strip Lot# HC022887
14. Were VOAs on the COC? Yes No NA
15. Were air bubbles >6 mm in any VOA vials? Yes No NA  ← Larger than this.
16. Was a VOA trip blank present in the cooler(s)? Trip Blank Lot # _____ Yes No NA
17. Was a LL Hg or Me Hg trip blank present? _____ Yes No NA

Tests that are not checked for pH by Receiving:

VOAs
Oil and Grease
TOC

Contacted PM _____ Date _____ by _____ via Verbal Voice Mail Other _____
 Concerning _____

18. CHAIN OF CUSTODY & SAMPLE DISCREPANCIES additional next page

Samples processed by: _____

19. SAMPLE CONDITION

Sample(s) _____ were received after the recommended holding time had expired.
 Sample(s) _____ were received in a broken container.
 Sample(s) _____ were received with bubble >6 mm in diameter. (Notify PM)

20. SAMPLE PRESERVATION

Sample(s) _____ were further preserved in the laboratory.
 Time preserved: _____ Preservative(s) added/Lot number(s): _____
 VOA Sample Preservation - Date/Time VOAs Frozen: _____

Temperature readings: _____

<u>Client Sample ID</u>	<u>Lab ID</u>	<u>Container Type</u>	<u>Container</u>		<u>Preservative</u>	
			<u>pH</u>	<u>Temp</u>	<u>Added (mls)</u>	<u>Lot #</u>
MW-15002	240-149188-A-1	Plastic 1 liter - Nitric Acid	<2	_____	_____	_____
MW-15002	240-149188-B-1	Plastic 1 liter - Nitric Acid	<2	_____	_____	_____
MW-15008	240-149188-A-2	Plastic 1 liter - Nitric Acid	<2	_____	_____	_____
MW-15008	240-149188-B-2	Plastic 1 liter - Nitric Acid	<2	_____	_____	_____
MW-15016	240-149188-A-3	Plastic 1 liter - Nitric Acid	<2	_____	_____	_____
MW-15016	240-149188-B-3	Plastic 1 liter - Nitric Acid	<2	_____	_____	_____
MW-15019	240-149188-A-4	Plastic 1 liter - Nitric Acid	<2	_____	_____	_____
MW-15019	240-149188-B-4	Plastic 1 liter - Nitric Acid	<2	_____	_____	_____
DUP-BACKGROUND	240-149188-A-5	Plastic 1 liter - Nitric Acid	<2	_____	_____	_____
DUP-BACKGROUND	240-149188-B-5	Plastic 1 liter - Nitric Acid	<2	_____	_____	_____
FB-BACKGROUND	240-149188-A-6	Plastic 1 liter - Nitric Acid	<2	_____	_____	_____
FB-BACKGROUND	240-149188-B-6	Plastic 1 liter - Nitric Acid	<2	_____	_____	_____

Chain of Custody Record



Client Information (Sub Contract Lab)		Sampler:	Lab PM:	Carrier Tracking No(s)	COC No:
Client Contact: Shipping/Receiving		Phone:	Brooks, Kris M	State of Origin: Michigan	240-136675.1
Company: TestAmerica Laboratories, Inc.		E-Mail: Kris.Brooks@Eurofins.com		Page: Page 1 of 1	Job #: 240-149188-1
Address: 13715 Rider Trail North,		Due Date Requested: 6/13/2021		Preservation Codes: M - Hexane N - None O - AsNaO2 P - Na2O4S Q - Na2SO3 R - Na2S2O3 S - H2SO4 T - TSP Dodecahydrate U - Ice V - MCAA W - pH 4-5 Z - other (specify)	
City: Earth City		TAT Requested (days):		Analysis Requested	
State, Zip: MO, 63045		PO #:		Total Number of Containers	
Phone: 314-298-8566(Tel) 314-298-8757(Fax)		WO #:		903.0/PrecSep_STD Standard Target List	
Email:		Project #: 24024154		904.0/PrecSep_0 Standard Target List	
Project Name: Karn/Weadock CCR Groundwater Monitoring		SSOW#:		Field Filtered Sample (Yes or No)	
Site:		Sample Date		Form MS/MSD (Yes or No)	
Sample Identification - Client ID (Lab ID)		Sample Time		Matrix (W=water, S=solid, O=wastewater, BT=tissue, A=air)	
MW-15002 (240-149188-1)	5/3/21	14:00 Eastern	Water	X	2
MW-15008 (240-149188-2)	5/3/21	15:56 Eastern	Water	X	2
MW-15016 (240-149188-3)	5/3/21	15:09 Eastern	Water	X	2
MW-15019 (240-149188-4)	5/3/21	16:03 Eastern	Water	X	2
DUP-BACKGROUND (240-149188-5)	5/3/21	16:03 Eastern	Water	X	2
FB-BACKGROUND (240-149188-6)	5/3/21	16:03 Eastern	Water	X	2
<p>Note: Since laboratory accreditations are subject to change, Eurofins TestAmerica places the ownership of method, analyte & accreditation compliance upon our subcontract laboratories. This sample shipment is forwarded under chain-of-custody. If the laboratory does not currently maintain accreditation in the State of Origin listed above for analysis/test/matrix being analyzed, the samples must be shipped back to the Eurofins TestAmerica laboratory or other instructions will be provided. Any changes to accreditation status should be brought to Eurofins TestAmerica attention immediately. If all requested accreditations are current to date, return the signed Chain of Custody attesting to said compliance to Eurofins TestAmerica.</p>					
Possible Hazard Identification					
Unconfirmed					
Deliverable Requested: I, II, III, IV, Other (specify)					
Primary Deliverable Rank: 2					
Empty Kit Relinquished by:					
Date:					
Relinquished by:					
Date/Time: 5-12-21 1700					
Relinquished by: <i>[Signature]</i>					
Date/Time: 5/13/21 0845					
Relinquished by: <i>[Signature]</i>					
Date/Time:					
Custody Seals Intact: <input type="checkbox"/> Yes <input type="checkbox"/> No					
Custody Seal No.:					
Cooler Temperature(s) °C and Other Remarks:					
<p>Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)</p> <input type="checkbox"/> Return To Client <input type="checkbox"/> Disposal By Lab <input type="checkbox"/> Archive For <input type="checkbox"/> Months					
Special Instructions/QC Requirements:					
Method of Shipment:					
Received by: FEDEX					
Date/Time:					
Received by: <i>[Signature]</i>					
Date/Time: 5/13/21 0845					
Received by: <i>[Signature]</i>					
Date/Time:					
Cooler Temperature(s) °C and Other Remarks:					



Login Sample Receipt Checklist

Client: TRC Environmental Corporation.

Job Number: 240-149188-1

Login Number: 149188

List Number: 2

Creator: Worthington, Sierra M

List Source: Eurofins TestAmerica, St. Louis

List Creation: 05/13/21 11:28 AM

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

ANALYTICAL REPORT

Eurofins TestAmerica, Canton
4101 Shuffel Street NW
North Canton, OH 44720
Tel: (330)497-9396

Laboratory Job ID: 240-149197-1

Client Project/Site: Karn/Weadock CCR DEK Bottom Ash Pond

For:

TRC Environmental Corporation.
1540 Eisenhower Place
Ann Arbor, Michigan 48108-7080

Attn: Darby Litz



Authorized for release by:
6/17/2021 1:29:23 PM

Kris Brooks, Project Manager II
(330)966-9790
Kris.Brooks@Eurofinset.com

LINKS

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results through
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Have a Question?



Visit us at:

www.eurofinsus.com/Env

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

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



Table of Contents

Cover Page	1
Table of Contents	2
Definitions/Glossary	3
Case Narrative	4
Method Summary	5
Sample Summary	6
Client Sample Results	7
Tracer Carrier Summary	12
QC Sample Results	13
QC Association Summary	15
Lab Chronicle	16
Certification Summary	18
Chain of Custody	19
Receipt Checklists	23

Definitions/Glossary

Client: TRC Environmental Corporation.
Project/Site: Karn/Weadock CCR DEK Bottom Ash Pond

Job ID: 240-149197-1

Qualifiers

Rad

Qualifier	Qualifier Description
U	Result is less than the sample detection limit.

Glossary

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

Case Narrative

Client: TRC Environmental Corporation.
Project/Site: Karn/Weadock CCR DEK Bottom Ash Pond

Job ID: 240-149197-1

Job ID: 240-149197-1

Laboratory: Eurofins TestAmerica, Canton

Narrative

Job Narrative 240-149197-1

Comments

The EPA Method 904.0 Radium-228, EPA Method 903.0 Radium-226, and Ra226_Ra228 Combined Radium 226 and Radium 228 analyses were performed at the Eurofins TestAmerica St. Louis laboratory.

Receipt

The samples were received on 5/12/2021 8:00 AM. Unless otherwise noted below, the samples arrived in good condition, and where required, properly preserved and on ice. The temperature of the cooler at receipt was 0.9° C.

RAD

Method 903.0: Radium 226 prep batch 160-510304: Any minimum detectable concentration (MDC), critical value (DLC), or Safe Drinking Water Act detection limit (SDWA DL) is sample-specific unless otherwise stated elsewhere in this narrative. Radiochemistry sample results are reported with the count date/time applied as the Activity Reference Date. DEK-MW-15002 (240-149197-1), DEK-MW-15004 (240-149197-2), DEK-MW-15005 (240-149197-3), DEK-MW-15006 (240-149197-4), DUP-DEK-BAP (240-149197-5), (LCS 160-510304/1-A), (LCSD 160-510304/2-A) and (MB 160-510304/22-A)

Method 904.0: Radium-228 Batch 510305: Any minimum detectable concentration (MDC), critical value (DLC), or Safe Drinking Water Act detection limit (SDWA DL) is sample-specific unless otherwise stated elsewhere in this narrative. Radiochemistry sample results are reported with the count date/time applied as the Activity Reference Date. DEK-MW-15002 (240-149197-1), DEK-MW-15004 (240-149197-2), DEK-MW-15005 (240-149197-3), DEK-MW-15006 (240-149197-4), DUP-DEK-BAP (240-149197-5), (LCS 160-510305/1-A), (LCSD 160-510305/2-A) and (MB 160-510305/22-A)

Method PrecSep_0: Ra-228 Batch 160-510305: Insufficient sample volume was available to perform a sample duplicate (DUP) for the following samples: DEK-MW-15002 (240-149197-1), DEK-MW-15004 (240-149197-2), DEK-MW-15005 (240-149197-3), DEK-MW-15006 (240-149197-4) and DUP-DEK-BAP (240-149197-5). A laboratory control sample/ laboratory control sample duplicate (LCS/LCSD) were prepared instead to demonstrate batch precision.

Method PrecSep_0: Ra-228 Batch 160- 510305: During the in-growth process, the following samples needed to be filtered due to sediment present in the sample: DEK-MW-15004 (240-149197-2) and DEK-MW-15006 (240-149197-4). This is an indicator of matrix interference.

Method PrecSep STD: Ra-226 Batch 160-510304: Insufficient sample volume was available to perform a sample duplicate (DUP) for the following samples: DEK-MW-15002 (240-149197-1), DEK-MW-15004 (240-149197-2), DEK-MW-15005 (240-149197-3), DEK-MW-15006 (240-149197-4) and DUP-DEK-BAP (240-149197-5). A laboratory control sample/ laboratory control sample duplicate (LCS/LCSD) were prepared instead to demonstrate batch precision.

Method PrecSep STD: Ra-226 Batch 160-510304: During the in-growth process, the following samples needed to be filtered due to sediment present in the sample: DEK-MW-15004 (240-149197-2) and DEK-MW-15006 (240-149197-4). This is an indicator of matrix interference.

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

Method Summary

Client: TRC Environmental Corporation.
Project/Site: Karn/Weadock CCR DEK Bottom Ash Pond

Job ID: 240-149197-1

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

Protocol References:

EPA = US Environmental Protection Agency

None = None

TAL-STL = TestAmerica Laboratories, St. Louis, Facility Standard Operating Procedure.

Laboratory References:

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

Sample Summary

Client: TRC Environmental Corporation.
Project/Site: Karn/Weadock CCR DEK Bottom Ash Pond

Job ID: 240-149197-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received	Asset ID
240-149197-1	DEK-MW-15002	Water	05/03/21 13:08	05/12/21 08:00	
240-149197-2	DEK-MW-15004	Water	05/03/21 14:10	05/12/21 08:00	
240-149197-3	DEK-MW-15005	Water	05/03/21 11:35	05/12/21 08:00	
240-149197-4	DEK-MW-15006	Water	05/03/21 10:25	05/12/21 08:00	
240-149197-5	DUP-DEK-BAP	Water	05/03/21 00:00	05/12/21 08:00	

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10
- 11
- 12
- 13
- 14

Client Sample Results

Client: TRC Environmental Corporation.
 Project/Site: Karn/Weadock CCR DEK Bottom Ash Pond

Job ID: 240-149197-1

Client Sample ID: DEK-MW-15002

Lab Sample ID: 240-149197-1

Date Collected: 05/03/21 13:08

Matrix: Water

Date Received: 05/12/21 08:00

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.582		0.185	0.192	1.00	0.180	pCi/L	05/18/21 13:46	06/15/21 07:08	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	78.1		40 - 110					05/18/21 13:46	06/15/21 07:08	1

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.229	U	0.321	0.322	1.00	0.537	pCi/L	05/18/21 14:33	06/11/21 14:17	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	78.1		40 - 110					05/18/21 14:33	06/11/21 14:17	1
Y Carrier	86.0		40 - 110					05/18/21 14:33	06/11/21 14:17	1

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

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.811		0.370	0.375	5.00	0.537	pCi/L		06/15/21 21:24	1

Client Sample Results

Client: TRC Environmental Corporation.
 Project/Site: Karn/Weadock CCR DEK Bottom Ash Pond

Job ID: 240-149197-1

Client Sample ID: DEK-MW-15004

Lab Sample ID: 240-149197-2

Date Collected: 05/03/21 14:10

Matrix: Water

Date Received: 05/12/21 08:00

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.180		0.122	0.123	1.00	0.171	pCi/L	05/18/21 13:46	06/15/21 07:08	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	86.8		40 - 110					05/18/21 13:46	06/15/21 07:08	1

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.677		0.308	0.314	1.00	0.442	pCi/L	05/18/21 14:33	06/11/21 14:17	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	86.8		40 - 110					05/18/21 14:33	06/11/21 14:17	1
Y Carrier	89.7		40 - 110					05/18/21 14:33	06/11/21 14:17	1

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

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.856		0.331	0.337	5.00	0.442	pCi/L		06/15/21 21:24	1

Client Sample Results

Client: TRC Environmental Corporation.
 Project/Site: Karn/Weadock CCR DEK Bottom Ash Pond

Job ID: 240-149197-1

Client Sample ID: DEK-MW-15005

Lab Sample ID: 240-149197-3

Date Collected: 05/03/21 11:35

Matrix: Water

Date Received: 05/12/21 08:00

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.291		0.139	0.141	1.00	0.170	pCi/L	05/18/21 13:46	06/15/21 07:08	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	88.6		40 - 110					05/18/21 13:46	06/15/21 07:08	1

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.431	U	0.295	0.298	1.00	0.459	pCi/L	05/18/21 14:33	06/11/21 14:17	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	88.6		40 - 110					05/18/21 14:33	06/11/21 14:17	1
Y Carrier	88.6		40 - 110					05/18/21 14:33	06/11/21 14:17	1

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

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.722		0.326	0.330	5.00	0.459	pCi/L		06/15/21 21:24	1

Client Sample Results

Client: TRC Environmental Corporation.
 Project/Site: Karn/Weadock CCR DEK Bottom Ash Pond

Job ID: 240-149197-1

Client Sample ID: DEK-MW-15006

Lab Sample ID: 240-149197-4

Date Collected: 05/03/21 10:25

Matrix: Water

Date Received: 05/12/21 08:00

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.353		0.160	0.163	1.00	0.197	pCi/L	05/18/21 13:46	06/15/21 07:08	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	80.8		40 - 110					05/18/21 13:46	06/15/21 07:08	1

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.804		0.333	0.341	1.00	0.464	pCi/L	05/18/21 14:33	06/11/21 14:18	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	80.8		40 - 110					05/18/21 14:33	06/11/21 14:18	1
Y Carrier	87.1		40 - 110					05/18/21 14:33	06/11/21 14:18	1

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

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	1.16		0.369	0.378	5.00	0.464	pCi/L		06/15/21 21:24	1

Client Sample Results

Client: TRC Environmental Corporation.
 Project/Site: Karn/Weadock CCR DEK Bottom Ash Pond

Job ID: 240-149197-1

Client Sample ID: DUP-DEK-BAP

Lab Sample ID: 240-149197-5

Date Collected: 05/03/21 00:00

Matrix: Water

Date Received: 05/12/21 08:00

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.171	U	0.127	0.128	1.00	0.187	pCi/L	05/18/21 13:46	06/15/21 07:08	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	87.7		40 - 110					05/18/21 13:46	06/15/21 07:08	1

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.479		0.295	0.298	1.00	0.450	pCi/L	05/18/21 14:33	06/11/21 14:18	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	87.7		40 - 110					05/18/21 14:33	06/11/21 14:18	1
Y Carrier	87.9		40 - 110					05/18/21 14:33	06/11/21 14:18	1

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

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.650		0.321	0.324	5.00	0.450	pCi/L		06/15/21 21:24	1

Tracer/Carrier Summary

Client: TRC Environmental Corporation.
Project/Site: Karn/Weadock CCR DEK Bottom Ash Pond

Job ID: 240-149197-1

Method: 903.0 - Radium-226 (GFPC)

Matrix: Water

Prep Type: Total/NA

Percent Yield (Acceptance Limits)

Lab Sample ID	Client Sample ID	Ba (40-110)
240-149197-1	DEK-MW-15002	78.1
240-149197-2	DEK-MW-15004	86.8
240-149197-3	DEK-MW-15005	88.6
240-149197-4	DEK-MW-15006	80.8
240-149197-5	DUP-DEK-BAP	87.7
LCS 160-510304/1-A	Lab Control Sample	82.0
LCSD 160-510304/2-A	Lab Control Sample Dup	87.1
MB 160-510304/22-A	Method Blank	86.8

Tracer/Carrier Legend

Ba = Ba Carrier

Method: 904.0 - Radium-228 (GFPC)

Matrix: Water

Prep Type: Total/NA

Percent Yield (Acceptance Limits)

Lab Sample ID	Client Sample ID	Ba (40-110)	Y (40-110)
240-149197-1	DEK-MW-15002	78.1	86.0
240-149197-2	DEK-MW-15004	86.8	89.7
240-149197-3	DEK-MW-15005	88.6	88.6
240-149197-4	DEK-MW-15006	80.8	87.1
240-149197-5	DUP-DEK-BAP	87.7	87.9
LCS 160-510305/1-A	Lab Control Sample	82.0	89.3
LCSD 160-510305/2-A	Lab Control Sample Dup	87.1	90.5
MB 160-510305/22-A	Method Blank	86.8	84.9

Tracer/Carrier Legend

Ba = Ba Carrier

Y = Y Carrier

QC Sample Results

Client: TRC Environmental Corporation.
 Project/Site: Karn/Weadock CCR DEK Bottom Ash Pond

Job ID: 240-149197-1

Method: 903.0 - Radium-226 (GFPC)

Lab Sample ID: MB 160-510304/22-A
Matrix: Water
Analysis Batch: 514296

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 510304

Analyte	MB	MB	Count	Total	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
	Result	Qualifier	Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Radium-226	0.1200	U	0.103	0.104	1.00	0.156	pCi/L	05/18/21 13:46	06/15/21 07:09	1
Carrier	MB	MB	Limits			Prepared	Analyzed	Dil Fac		
	%Yield	Qualifier								
Ba Carrier	86.8		40 - 110			05/18/21 13:46	06/15/21 07:09	1		

Lab Sample ID: LCS 160-510304/1-A
Matrix: Water
Analysis Batch: 514248

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 510304

Analyte	Spike Added	LCS Result	LCS Qual	Total	RL	MDC	Unit	%Rec	%Rec. Limits
				Uncert. (2σ+/-)					
Radium-226	11.3	10.88		1.21	1.00	0.208	pCi/L	96	75 - 125
Carrier	LCS	LCS	Limits			Prepared	Analyzed	Dil Fac	
	%Yield	Qualifier							
Ba Carrier	82.0		40 - 110						

Lab Sample ID: LCSD 160-510304/2-A
Matrix: Water
Analysis Batch: 514248

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 510304

Analyte	Spike Added	LCSD Result	LCSD Qual	Total	RL	MDC	Unit	%Rec	%Rec. Limits	RER	Limit
				Uncert. (2σ+/-)							
Radium-226	11.3	11.52		1.25	1.00	0.163	pCi/L	102	75 - 125	0.26	1
Carrier	LCSD	LCSD	Limits			Prepared	Analyzed	Dil Fac			
	%Yield	Qualifier									
Ba Carrier	87.1		40 - 110								

Method: 904.0 - Radium-228 (GFPC)

Lab Sample ID: MB 160-510305/22-A
Matrix: Water
Analysis Batch: 513770

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 510305

Analyte	MB	MB	Count	Total	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
	Result	Qualifier	Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Radium-228	0.1192	U	0.255	0.256	1.00	0.439	pCi/L	05/18/21 14:33	06/11/21 14:18	1
Carrier	MB	MB	Limits			Prepared	Analyzed	Dil Fac		
	%Yield	Qualifier								
Ba Carrier	86.8		40 - 110			05/18/21 14:33	06/11/21 14:18	1		
Y Carrier	84.9		40 - 110			05/18/21 14:33	06/11/21 14:18	1		

QC Sample Results

Client: TRC Environmental Corporation.
 Project/Site: Karn/Weadock CCR DEK Bottom Ash Pond

Job ID: 240-149197-1

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

Lab Sample ID: LCS 160-510305/1-A
Matrix: Water
Analysis Batch: 513948

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 510305

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits	
									75	125
Radium-228	9.64	9.496		1.16	1.00	0.469	pCi/L	99	75	125
LCS LCS										
Carrier	%Yield	Qualifier	Limits							
Ba Carrier	82.0		40 - 110							
Y Carrier	89.3		40 - 110							

Lab Sample ID: LCSD 160-510305/2-A
Matrix: Water
Analysis Batch: 513948

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 510305

Analyte	Spike Added	LCSD Result	LCSD Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits		RER	Limit
									75	125	0.18	1
Radium-228	9.64	9.100		1.10	1.00	0.397	pCi/L	94	75	125	0.18	1
LCSD LCSD												
Carrier	%Yield	Qualifier	Limits									
Ba Carrier	87.1		40 - 110									
Y Carrier	90.5		40 - 110									

QC Association Summary

Client: TRC Environmental Corporation.
Project/Site: Karn/Weadock CCR DEK Bottom Ash Pond

Job ID: 240-149197-1

Rad

Prep Batch: 510304

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-149197-1	DEK-MW-15002	Total/NA	Water	PrecSep STD	
240-149197-2	DEK-MW-15004	Total/NA	Water	PrecSep STD	
240-149197-3	DEK-MW-15005	Total/NA	Water	PrecSep STD	
240-149197-4	DEK-MW-15006	Total/NA	Water	PrecSep STD	
240-149197-5	DUP-DEK-BAP	Total/NA	Water	PrecSep STD	
MB 160-510304/22-A	Method Blank	Total/NA	Water	PrecSep STD	
LCS 160-510304/1-A	Lab Control Sample	Total/NA	Water	PrecSep STD	
LCSD 160-510304/2-A	Lab Control Sample Dup	Total/NA	Water	PrecSep STD	

Prep Batch: 510305

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-149197-1	DEK-MW-15002	Total/NA	Water	PrecSep_0	
240-149197-2	DEK-MW-15004	Total/NA	Water	PrecSep_0	
240-149197-3	DEK-MW-15005	Total/NA	Water	PrecSep_0	
240-149197-4	DEK-MW-15006	Total/NA	Water	PrecSep_0	
240-149197-5	DUP-DEK-BAP	Total/NA	Water	PrecSep_0	
MB 160-510305/22-A	Method Blank	Total/NA	Water	PrecSep_0	
LCS 160-510305/1-A	Lab Control Sample	Total/NA	Water	PrecSep_0	
LCSD 160-510305/2-A	Lab Control Sample Dup	Total/NA	Water	PrecSep_0	

Lab Chronicle

Client: TRC Environmental Corporation.
Project/Site: Karn/Weadock CCR DEK Bottom Ash Pond

Job ID: 240-149197-1

Client Sample ID: DEK-MW-15002

Lab Sample ID: 240-149197-1

Date Collected: 05/03/21 13:08

Matrix: Water

Date Received: 05/12/21 08:00

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	PrecSep STD			510304	05/18/21 13:46	HRT	TAL SL
Total/NA	Analysis	903.0		1	514296	06/15/21 07:08	FLC	TAL SL
Total/NA	Prep	PrecSep_0			510305	05/18/21 14:33	MJ	TAL SL
Total/NA	Analysis	904.0		1	513770	06/11/21 14:17	SCB	TAL SL
Total/NA	Analysis	Ra226_Ra228		1	514477	06/15/21 21:24	GRW	TAL SL

Client Sample ID: DEK-MW-15004

Lab Sample ID: 240-149197-2

Date Collected: 05/03/21 14:10

Matrix: Water

Date Received: 05/12/21 08:00

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	PrecSep STD			510304	05/18/21 13:46	HRT	TAL SL
Total/NA	Analysis	903.0		1	514296	06/15/21 07:08	FLC	TAL SL
Total/NA	Prep	PrecSep_0			510305	05/18/21 14:33	MJ	TAL SL
Total/NA	Analysis	904.0		1	513770	06/11/21 14:17	SCB	TAL SL
Total/NA	Analysis	Ra226_Ra228		1	514477	06/15/21 21:24	GRW	TAL SL

Client Sample ID: DEK-MW-15005

Lab Sample ID: 240-149197-3

Date Collected: 05/03/21 11:35

Matrix: Water

Date Received: 05/12/21 08:00

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	PrecSep STD			510304	05/18/21 13:46	HRT	TAL SL
Total/NA	Analysis	903.0		1	514296	06/15/21 07:08	FLC	TAL SL
Total/NA	Prep	PrecSep_0			510305	05/18/21 14:33	MJ	TAL SL
Total/NA	Analysis	904.0		1	513770	06/11/21 14:17	SCB	TAL SL
Total/NA	Analysis	Ra226_Ra228		1	514477	06/15/21 21:24	GRW	TAL SL

Client Sample ID: DEK-MW-15006

Lab Sample ID: 240-149197-4

Date Collected: 05/03/21 10:25

Matrix: Water

Date Received: 05/12/21 08:00

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	PrecSep STD			510304	05/18/21 13:46	HRT	TAL SL
Total/NA	Analysis	903.0		1	514296	06/15/21 07:08	FLC	TAL SL
Total/NA	Prep	PrecSep_0			510305	05/18/21 14:33	MJ	TAL SL
Total/NA	Analysis	904.0		1	513770	06/11/21 14:18	SCB	TAL SL
Total/NA	Analysis	Ra226_Ra228		1	514477	06/15/21 21:24	GRW	TAL SL

Lab Chronicle

Client: TRC Environmental Corporation.
Project/Site: Karn/Weadock CCR DEK Bottom Ash Pond

Job ID: 240-149197-1

Client Sample ID: DUP-DEK-BAP

Lab Sample ID: 240-149197-5

Date Collected: 05/03/21 00:00

Matrix: Water

Date Received: 05/12/21 08:00

<u>Prep Type</u>	<u>Batch Type</u>	<u>Batch Method</u>	<u>Run</u>	<u>Dilution Factor</u>	<u>Batch Number</u>	<u>Prepared or Analyzed</u>	<u>Analyst</u>	<u>Lab</u>
Total/NA	Prep	PrecSep STD			510304	05/18/21 13:46	HRT	TAL SL
Total/NA	Analysis	903.0		1	514296	06/15/21 07:08	FLC	TAL SL
Total/NA	Prep	PrecSep_0			510305	05/18/21 14:33	MJ	TAL SL
Total/NA	Analysis	904.0		1	513770	06/11/21 14:18	SCB	TAL SL
Total/NA	Analysis	Ra226_Ra228		1	514477	06/15/21 21:24	GRW	TAL SL

Laboratory References:

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



Accreditation/Certification Summary

Client: TRC Environmental Corporation.
 Project/Site: Karn/Weadock CCR DEK Bottom Ash Pond

Job ID: 240-149197-1

Laboratory: Eurofins TestAmerica, St. Louis

All accreditations/certifications held by this laboratory are listed. Not all accreditations/certifications are applicable to this report.

Authority	Program	Identification Number	Expiration Date
Alaska (UST)	State	20-001	05-06-22
ANAB	Dept. of Defense ELAP	L2305	04-06-22
ANAB	Dept. of Energy	L2305.01	04-06-22
ANAB	ISO/IEC 17025	L2305	04-06-22
Arizona	State	AZ0813	12-08-21
California	Los Angeles County Sanitation Districts	10259	06-30-21
California	State	2886	06-30-21
Connecticut	State	PH-0241	03-31-23
Florida	NELAP	E87689	06-30-21
HI - RadChem Recognition	State	n/a	06-30-21
Illinois	NELAP	004553	11-30-21
Iowa	State	373	12-01-22
Kansas	NELAP	E-10236	10-31-21
Kentucky (DW)	State	KY90125	01-01-22
Kentucky (WW)	State	KY90125 (Permit KY0004049)	12-31-21
Louisiana	NELAP	04080	06-30-21
Louisiana (DW)	State	LA011	12-31-21
Maryland	State	310	09-30-21
MI - RadChem Recognition	State	9005	06-30-21
Missouri	State	780	06-30-22
Nevada	State	MO000542020-1	07-31-21
New Jersey	NELAP	MO002	06-30-21
New York	NELAP	11616	04-01-22
North Dakota	State	R-207	06-30-21
NRC	NRC	24-24817-01	12-31-22
Oklahoma	State	9997	08-31-21
Oregon	NELAP	4157	09-01-21
Pennsylvania	NELAP	68-00540	03-01-22
South Carolina	State	85002001	06-30-21
Texas	NELAP	T104704193	07-31-21
US Fish & Wildlife	US Federal Programs	058448	07-31-21
USDA	US Federal Programs	P330-17-00028	03-11-23
Utah	NELAP	MO000542019-11	07-31-21
Virginia	NELAP	10310	06-14-22
Washington	State	C592	08-30-21
West Virginia DEP	State	381	10-31-21

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Eurofins TestAmerica Canton Sample Receipt Form/Narrative Login # : 149197
Canton Facility

Client Jacob Krenz Site Name _____ Cooler unpacked by: Trent C
Cooler Received on 5/12/21 Opened on 5/12/21
FedEx: 1st Grd Exp UPS FAS Clipper Client Drop Off TestAmerica Courier Other _____

Receipt After-hours: Drop-off Date/Time _____ **Storage Location** _____

TestAmerica Cooler # _____ Foam Box _____ Client Cooler _____ Box _____ Other _____
Packing material used: Bubble Wrap Foam _____ Plastic Bag _____ None _____ Other _____
COOLANT: Wet Ice Blue Ice _____ Dry Ice _____ Water _____ None _____

1. Cooler temperature upon receipt See Multiple Cooler Form
IR GUN# IR-11 (CF +0.1 °C) Observed Cooler Temp. 0.8 °C Corrected Cooler Temp. 0.7 °C
IR GUN #IR-12 (CF +0.2°C) Observed Cooler Temp. _____ °C Corrected Cooler Temp. _____ °C

2. Were tamper/custody seals on the outside of the cooler(s)? If Yes Quantity Yes No _____
-Were the seals on the outside of the cooler(s) signed & dated? Yes No NA _____
-Were tamper/custody seals on the bottle(s) or bottle kits (LLHg/MeHg)? Yes No NA _____
-Were tamper/custody seals intact and uncompromised? Yes No NA _____

3. Shippers' packing slip attached to the cooler(s)? Yes No _____
4. Did custody papers accompany the sample(s)? Yes No _____
5. Were the custody papers relinquished & signed in the appropriate place? Yes No _____
6. Was/were the person(s) who collected the samples clearly identified on the COC? Yes No _____
7. Did all bottles arrive in good condition (Unbroken)? Yes No _____
8. Could all bottle labels (ID/Date/Time) be reconciled with the COC? Yes No _____
9. For each sample, does the COC specify preservatives (Y/N), # of containers (Y/N), and sample type of grab/comp (Y/N)? Yes No _____
10. Were correct bottle(s) used for the test(s) indicated? Yes No _____
11. Sufficient quantity received to perform indicated analyses? Yes No _____
12. Are these work share samples and all listed on the COC? Yes No _____
If yes, Questions 13-17 have been checked at the originating laboratory.

13. Were all preserved sample(s) at the correct pH upon receipt? Yes No NA pH Strip Lot# HC022887
14. Were VOAs on the COC? Yes No _____
15. Were air bubbles >6 mm in any VOA vials? Yes No NA Larger than this.
16. Was a VOA trip blank present in the cooler(s)? Trip Blank Lot # _____ Yes No _____
17. Was a LL Hg or Me Hg trip blank present? _____ Yes No _____

Contacted PM _____ Date _____ by _____ via Verbal Voice Mail Other _____
Concerning _____

Tests that are not checked for pH by Receiving:
VOAs
Oil and Grease
TOC

18. CHAIN OF CUSTODY & SAMPLE DISCREPANCIES additional next page Samples processed by: _____

19. SAMPLE CONDITION
Sample(s) _____ were received after the recommended holding time had expired.
Sample(s) _____ were received in a broken container.
Sample(s) _____ were received with bubble >6 mm in diameter. (Notify PM)

20. SAMPLE PRESERVATION
Sample(s) _____ were further preserved in the laboratory.
Time preserved: _____ Preservative(s) added/Lot number(s): _____
VOA Sample Preservation - Date/Time VOAs Frozen: _____

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Temperature readings: _____

<u>Client Sample ID</u>	<u>Lab ID</u>	<u>Container Type</u>	<u>Container</u>		<u>Preservative</u>	
			<u>pH</u>	<u>Temp</u>	<u>Added (mls)</u>	<u>Lot #</u>
SL #2 COMP	190-25902-A-1	Plastic 250ml - with Sulfuric Acid	<2	_____	_____	_____
SL #2 COMP	190-25902-B-1	Plastic 250ml - with Nitric Acid	<2	_____	_____	_____

Chain of Custody Record



Client Information (Sub Contract Lab)		Lab PM: Brooks, Kris M	Carrier Tracking No(s): 240-136682.1
Client Contact: Shipping/Receiving		E-Mail: Kris.Brooks@Eurofins.com	Page: Page 1 of 1
Company: TestAmerica Laboratories, Inc.		Job #: 240-149197-1	
Address: 13715 Rider Trail North,		Preservation Codes: M - Hexane N - None O - AsNaO2 P - Na2O4S Q - Na2SO3 R - Na2S2O3 S - H2SO4 T - TSP Dodecahydrate U - Acetone V - MCAA W - pH 4-5 Z - other (specify) Other:	
City: Earth City		Analysis Requested	
State, Zip: MO, 63045		Total Number of Containers	
Phone: 314-298-8566(Tel) 314-298-8757(Fax)		904.0/PrecSep_0 Standard Target List	
Email:		903.0/PrecSep_STD Standard Target List	
Project Name: Karm/Weadock CCR Groundwater Monitoring		Field Filtered Sample (Yes or No)	
Site: 24024154		Perform MS/MSD (Yes or No)	
SSOW#:		R226Ra228_GFPc	
Sample Identification - Client ID (Lab ID)		Special Instructions/Note:	
Sample Date	Sample Time	Sample Type (C=Comp, G=grab)	Matrix (W=water, S=solid, O=wastewater, BT=tissue, A=AI)
5/3/21	13:08 Eastern	Water	Water
5/3/21	14:10 Eastern	Water	Water
5/3/21	11:35 Eastern	Water	Water
5/3/21	10:25 Eastern	Water	Water
5/3/21	Eastern	Water	Water
Note: Since laboratory accreditations are subject to change, Eurofins TestAmerica places the ownership of method, analyte & accreditation compliance upon our subcontract laboratories. This sample shipment is forwarded under chain-of-custody. If the laboratory does not currently maintain accreditation in the State of Origin listed above for analysis/test/matrix being analyzed, the samples must be shipped back to the Eurofins TestAmerica laboratory or other instructions will be provided. Any changes to accreditation status should be brought to Eurofins TestAmerica attention immediately. If all requested accreditations are current to date, return the signed Chain of Custody attesting to said compliance to Eurofins TestAmerica.			
Possible Hazard Identification			
Unconfirmed			
Deliverable Requested: I, II, III, IV, Other (specify)			
Primary Deliverable Rank: 2			
Date:			
Relinquished by: <i>[Signature]</i> Company: <i>[Signature]</i>			
Relinquished by: FEDEX Date/Time: 5-12-21 1715			
Relinquished by: <i>[Signature]</i> Company: <i>[Signature]</i>			
Relinquished by: FEDEX Date/Time: 5/13/21 0845			
Custody Seal No.: <i>[Signature]</i> Company: <i>[Signature]</i>			
Custody Seals Intact: <input type="checkbox"/> Yes <input type="checkbox"/> No			
Cooler Temperature(s) °C and Other Remarks:			



Login Sample Receipt Checklist

Client: TRC Environmental Corporation.

Job Number: 240-149197-1

Login Number: 149197

List Number: 2

Creator: Worthington, Sierra M

List Source: Eurofins TestAmerica, St. Louis

List Creation: 05/13/21 11:28 AM

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

ANALYTICAL REPORT

Eurofins TestAmerica, Canton
4101 Shuffel Street NW
North Canton, OH 44720
Tel: (330)497-9396

Laboratory Job ID: 240-149195-1

Client Project/Site: Karn/Weadock CCR DEK Bottom Ash Pond

For:

TRC Environmental Corporation.
1540 Eisenhower Place
Ann Arbor, Michigan 48108-7080

Attn: Darby Litz



Authorized for release by:
6/17/2021 1:22:47 PM

Kris Brooks, Project Manager II
(330)966-9790
Kris.Brooks@Eurofinset.com

LINKS

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results through
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www.eurofinsus.com/Env

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

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



Table of Contents

Cover Page	1
Table of Contents	2
Definitions/Glossary	3
Case Narrative	4
Method Summary	5
Sample Summary	6
Client Sample Results	7
Tracer Carrier Summary	9
QC Sample Results	10
QC Association Summary	12
Lab Chronicle	13
Certification Summary	14
Chain of Custody	15
Receipt Checklists	18

Definitions/Glossary

Client: TRC Environmental Corporation.
Project/Site: Karn/Weadock CCR DEK Bottom Ash Pond

Job ID: 240-149195-1

Qualifiers

Rad

Qualifier	Qualifier Description
U	Result is less than the sample detection limit.

Glossary

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

Case Narrative

Client: TRC Environmental Corporation.
Project/Site: Karn/Weadock CCR DEK Bottom Ash Pond

Job ID: 240-149195-1

Job ID: 240-149195-1

Laboratory: Eurofins TestAmerica, Canton

Narrative

Job Narrative 240-149195-1

Comments

The EPA Method 904.0 Radium-228, EPA Method 903.0 Radium-226, and Ra226_Ra228 Combined Radium 226 and Radium 228 analyses were performed at the Eurofins TestAmerica St. Louis laboratory.

Receipt

The samples were received on 5/12/2021 8:00 AM. Unless otherwise noted below, the samples arrived in good condition, and where required, properly preserved and on ice. The temperature of the cooler at receipt was 0.9° C.

RAD

Method 903.0: Radium 226 prep batch 160-510304: Any minimum detectable concentration (MDC), critical value (DLC), or Safe Drinking Water Act detection limit (SDWA DL) is sample-specific unless otherwise stated elsewhere in this narrative. Radiochemistry sample results are reported with the count date/time applied as the Activity Reference Date. DEK-MW-15003 (240-149195-1), DEK-MW-18001 (240-149195-2), (LCS 160-510304/1-A), (LCSD 160-510304/2-A) and (MB 160-510304/22-A)

Method 904.0: Radium-228 Batch 510305: Any minimum detectable concentration (MDC), critical value (DLC), or Safe Drinking Water Act detection limit (SDWA DL) is sample-specific unless otherwise stated elsewhere in this narrative. Radiochemistry sample results are reported with the count date/time applied as the Activity Reference Date. DEK-MW-15003 (240-149195-1), DEK-MW-18001 (240-149195-2), (LCS 160-510305/1-A), (LCSD 160-510305/2-A) and (MB 160-510305/22-A)

Method PrecSep_0: Ra-228 Batch 160-510305: Insufficient sample volume was available to perform a sample duplicate (DUP) for the following samples: DEK-MW-15003 (240-149195-1) and DEK-MW-18001 (240-149195-2). A laboratory control sample/ laboratory control sample duplicate (LCS/LCSD) were prepared instead to demonstrate batch precision.

Method PrecSep_0: Ra-228 Batch 160- 510305: During the in-growth process, the following samples needed to be filtered due to sediment present in the sample: DEK-MW-15003 (240-149195-1). This is an indicator of matrix interference.

Method PrecSep STD: Ra-226 Batch 160-510304: Insufficient sample volume was available to perform a sample duplicate (DUP) for the following samples: DEK-MW-15003 (240-149195-1) and DEK-MW-18001 (240-149195-2). A laboratory control sample/ laboratory control sample duplicate (LCS/LCSD) were prepared instead to demonstrate batch precision.

Method PrecSep STD: Ra-226 Batch 160-510304: During the in-growth process, the following samples needed to be filtered due to sediment present in the sample: DEK-MW-15003 (240-149195-1). This is an indicator of matrix interference.

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

Method Summary

Client: TRC Environmental Corporation.
Project/Site: Karn/Weadock CCR DEK Bottom Ash Pond

Job ID: 240-149195-1

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

Protocol References:

EPA = US Environmental Protection Agency

None = None

TAL-STL = TestAmerica Laboratories, St. Louis, Facility Standard Operating Procedure.

Laboratory References:

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

Sample Summary

Client: TRC Environmental Corporation.
Project/Site: Karn/Weadock CCR DEK Bottom Ash Pond

Job ID: 240-149195-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received	Asset ID
240-149195-1	DEK-MW-15003	Water	05/03/21 12:33	05/12/21 08:00	
240-149195-2	DEK-MW-18001	Water	05/03/21 11:28	05/12/21 08:00	

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Client Sample Results

Client: TRC Environmental Corporation.
 Project/Site: Karn/Weadock CCR DEK Bottom Ash Pond

Job ID: 240-149195-1

Client Sample ID: DEK-MW-15003

Lab Sample ID: 240-149195-1

Date Collected: 05/03/21 12:33

Matrix: Water

Date Received: 05/12/21 08:00

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.0790	U	0.100	0.100	1.00	0.166	pCi/L	05/18/21 13:46	06/15/21 07:07	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	79.3		40 - 110					05/18/21 13:46	06/15/21 07:07	1

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	-0.0302	U	0.305	0.305	1.00	0.548	pCi/L	05/18/21 14:33	06/11/21 14:17	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	79.3		40 - 110					05/18/21 14:33	06/11/21 14:17	1
Y Carrier	90.1		40 - 110					05/18/21 14:33	06/11/21 14:17	1

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

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.0488	U	0.321	0.321	5.00	0.548	pCi/L		06/15/21 21:24	1

Client Sample Results

Client: TRC Environmental Corporation.
 Project/Site: Karn/Weadock CCR DEK Bottom Ash Pond

Job ID: 240-149195-1

Client Sample ID: DEK-MW-18001

Lab Sample ID: 240-149195-2

Date Collected: 05/03/21 11:28

Matrix: Water

Date Received: 05/12/21 08:00

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.189		0.119	0.120	1.00	0.162	pCi/L	05/18/21 13:46	06/15/21 07:08	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	90.1		40 - 110					05/18/21 13:46	06/15/21 07:08	1

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.639		0.388	0.393	1.00	0.596	pCi/L	05/18/21 14:33	06/11/21 14:17	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	90.1		40 - 110					05/18/21 14:33	06/11/21 14:17	1
Y Carrier	69.9		40 - 110					05/18/21 14:33	06/11/21 14:17	1

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

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.828		0.406	0.411	5.00	0.596	pCi/L		06/15/21 21:24	1

Tracer/Carrier Summary

Client: TRC Environmental Corporation.
Project/Site: Karn/Weadock CCR DEK Bottom Ash Pond

Job ID: 240-149195-1

Method: 903.0 - Radium-226 (GFPC)

Matrix: Water

Prep Type: Total/NA

Percent Yield (Acceptance Limits)

Lab Sample ID	Client Sample ID	Ba (40-110)							
240-149195-1	DEK-MW-15003	79.3							
240-149195-2	DEK-MW-18001	90.1							
LCS 160-510304/1-A	Lab Control Sample	82.0							
LCS 160-510304/2-A	Lab Control Sample Dup	87.1							
MB 160-510304/22-A	Method Blank	86.8							

Tracer/Carrier Legend

Ba = Ba Carrier

Method: 904.0 - Radium-228 (GFPC)

Matrix: Water

Prep Type: Total/NA

Percent Yield (Acceptance Limits)

Lab Sample ID	Client Sample ID	Ba (40-110)	Y (40-110)						
240-149195-1	DEK-MW-15003	79.3	90.1						
240-149195-2	DEK-MW-18001	90.1	69.9						
LCS 160-510305/1-A	Lab Control Sample	82.0	89.3						
LCS 160-510305/2-A	Lab Control Sample Dup	87.1	90.5						
MB 160-510305/22-A	Method Blank	86.8	84.9						

Tracer/Carrier Legend

Ba = Ba Carrier

Y = Y Carrier

QC Sample Results

Client: TRC Environmental Corporation.
 Project/Site: Karn/Weadock CCR DEK Bottom Ash Pond

Job ID: 240-149195-1

Method: 903.0 - Radium-226 (GFPC)

Lab Sample ID: MB 160-510304/22-A
Matrix: Water
Analysis Batch: 514296

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 510304

Analyte	MB	MB	Count	Total	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
	Result	Qualifier	Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Radium-226	0.1200	U	0.103	0.104	1.00	0.156	pCi/L	05/18/21 13:46	06/15/21 07:09	1
Carrier	MB	MB	Limits			Prepared	Analyzed	Dil Fac		
	%Yield	Qualifier								
Ba Carrier	86.8		40 - 110			05/18/21 13:46	06/15/21 07:09	1		

Lab Sample ID: LCS 160-510304/1-A
Matrix: Water
Analysis Batch: 514248

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 510304

Analyte	Spike Added	LCS Result	LCS Qual	Total	RL	MDC	Unit	%Rec	%Rec. Limits
				Uncert. (2σ+/-)					
Radium-226	11.3	10.88		1.21	1.00	0.208	pCi/L	96	75 - 125
Carrier	LCS	LCS	Limits			Prepared	Analyzed	Dil Fac	
	%Yield	Qualifier							
Ba Carrier	82.0		40 - 110						

Lab Sample ID: LCSD 160-510304/2-A
Matrix: Water
Analysis Batch: 514248

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 510304

Analyte	Spike Added	LCSD Result	LCSD Qual	Total	RL	MDC	Unit	%Rec	%Rec. Limits	RER	RER Limit
				Uncert. (2σ+/-)							
Radium-226	11.3	11.52		1.25	1.00	0.163	pCi/L	102	75 - 125	0.26	1
Carrier	LCSD	LCSD	Limits			Prepared	Analyzed	Dil Fac			
	%Yield	Qualifier									
Ba Carrier	87.1		40 - 110								

Method: 904.0 - Radium-228 (GFPC)

Lab Sample ID: MB 160-510305/22-A
Matrix: Water
Analysis Batch: 513770

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 510305

Analyte	MB	MB	Count	Total	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
	Result	Qualifier	Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Radium-228	0.1192	U	0.255	0.256	1.00	0.439	pCi/L	05/18/21 14:33	06/11/21 14:18	1
Carrier	MB	MB	Limits			Prepared	Analyzed	Dil Fac		
	%Yield	Qualifier								
Ba Carrier	86.8		40 - 110			05/18/21 14:33	06/11/21 14:18	1		
Y Carrier	84.9		40 - 110			05/18/21 14:33	06/11/21 14:18	1		

QC Sample Results

Client: TRC Environmental Corporation.
 Project/Site: Karn/Weadock CCR DEK Bottom Ash Pond

Job ID: 240-149195-1

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

Lab Sample ID: LCS 160-510305/1-A
Matrix: Water
Analysis Batch: 513948

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 510305

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits	
									75	125
Radium-228	9.64	9.496		1.16	1.00	0.469	pCi/L	99	75	125
LCS LCS										
Carrier	%Yield	Qualifier	Limits							
Ba Carrier	82.0		40 - 110							
Y Carrier	89.3		40 - 110							

Lab Sample ID: LCSD 160-510305/2-A
Matrix: Water
Analysis Batch: 513948

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 510305

Analyte	Spike Added	LCSD Result	LCSD Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits		RER	Limit
									75	125	0.18	1
Radium-228	9.64	9.100		1.10	1.00	0.397	pCi/L	94	75	125	0.18	1
LCSD LCSD												
Carrier	%Yield	Qualifier	Limits									
Ba Carrier	87.1		40 - 110									
Y Carrier	90.5		40 - 110									

QC Association Summary

Client: TRC Environmental Corporation.
Project/Site: Karn/Weadock CCR DEK Bottom Ash Pond

Job ID: 240-149195-1

Rad

Prep Batch: 510304

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-149195-1	DEK-MW-15003	Total/NA	Water	PrecSep STD	
240-149195-2	DEK-MW-18001	Total/NA	Water	PrecSep STD	
MB 160-510304/22-A	Method Blank	Total/NA	Water	PrecSep STD	
LCS 160-510304/1-A	Lab Control Sample	Total/NA	Water	PrecSep STD	
LCSD 160-510304/2-A	Lab Control Sample Dup	Total/NA	Water	PrecSep STD	

Prep Batch: 510305

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-149195-1	DEK-MW-15003	Total/NA	Water	PrecSep_0	
240-149195-2	DEK-MW-18001	Total/NA	Water	PrecSep_0	
MB 160-510305/22-A	Method Blank	Total/NA	Water	PrecSep_0	
LCS 160-510305/1-A	Lab Control Sample	Total/NA	Water	PrecSep_0	
LCSD 160-510305/2-A	Lab Control Sample Dup	Total/NA	Water	PrecSep_0	

Lab Chronicle

Client: TRC Environmental Corporation.
Project/Site: Karn/Weadock CCR DEK Bottom Ash Pond

Job ID: 240-149195-1

Client Sample ID: DEK-MW-15003

Lab Sample ID: 240-149195-1

Date Collected: 05/03/21 12:33

Matrix: Water

Date Received: 05/12/21 08:00

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	PrecSep STD			510304	05/18/21 13:46	HRT	TAL SL
Total/NA	Analysis	903.0		1	514296	06/15/21 07:07	FLC	TAL SL
Total/NA	Prep	PrecSep_0			510305	05/18/21 14:33	MJ	TAL SL
Total/NA	Analysis	904.0		1	513770	06/11/21 14:17	SCB	TAL SL
Total/NA	Analysis	Ra226_Ra228		1	514477	06/15/21 21:24	GRW	TAL SL

Client Sample ID: DEK-MW-18001

Lab Sample ID: 240-149195-2

Date Collected: 05/03/21 11:28

Matrix: Water

Date Received: 05/12/21 08:00

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	PrecSep STD			510304	05/18/21 13:46	HRT	TAL SL
Total/NA	Analysis	903.0		1	514296	06/15/21 07:08	FLC	TAL SL
Total/NA	Prep	PrecSep_0			510305	05/18/21 14:33	MJ	TAL SL
Total/NA	Analysis	904.0		1	513770	06/11/21 14:17	SCB	TAL SL
Total/NA	Analysis	Ra226_Ra228		1	514477	06/15/21 21:24	GRW	TAL SL

Laboratory References:

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

Accreditation/Certification Summary

Client: TRC Environmental Corporation.
 Project/Site: Karn/Weadock CCR DEK Bottom Ash Pond

Job ID: 240-149195-1


Laboratory: Eurofins TestAmerica, St. Louis

All accreditations/certifications held by this laboratory are listed. Not all accreditations/certifications are applicable to this report.

Authority	Program	Identification Number	Expiration Date
Alaska (UST)	State	20-001	05-06-22
ANAB	Dept. of Defense ELAP	L2305	04-06-22
ANAB	Dept. of Energy	L2305.01	04-06-22
ANAB	ISO/IEC 17025	L2305	04-06-22
Arizona	State	AZ0813	12-08-21
California	Los Angeles County Sanitation Districts	10259	06-30-21
California	State	2886	06-30-21
Connecticut	State	PH-0241	03-31-23
Florida	NELAP	E87689	06-30-21
HI - RadChem Recognition	State	n/a	06-30-21
Illinois	NELAP	004553	11-30-21
Iowa	State	373	12-01-22
Kansas	NELAP	E-10236	10-31-21
Kentucky (DW)	State	KY90125	01-01-22
Kentucky (WW)	State	KY90125 (Permit KY0004049)	12-31-21
Louisiana	NELAP	04080	06-30-21
Louisiana (DW)	State	LA011	12-31-21
Maryland	State	310	09-30-21
MI - RadChem Recognition	State	9005	06-30-21
Missouri	State	780	06-30-22
Nevada	State	MO000542020-1	07-31-21
New Jersey	NELAP	MO002	06-30-21
New York	NELAP	11616	04-01-22
North Dakota	State	R-207	06-30-21
NRC	NRC	24-24817-01	12-31-22
Oklahoma	State	9997	08-31-21
Oregon	NELAP	4157	09-01-21
Pennsylvania	NELAP	68-00540	03-01-22
South Carolina	State	85002001	06-30-21
Texas	NELAP	T104704193	07-31-21
US Fish & Wildlife	US Federal Programs	058448	07-31-21
USDA	US Federal Programs	P330-17-00028	03-11-23
Utah	NELAP	MO000542019-11	07-31-21
Virginia	NELAP	10310	06-14-22
Washington	State	C592	08-30-21
West Virginia DEP	State	381	10-31-21

0.8/0.1

Client Information Client Contact: Jacob Krenz Company: TRC Environmental Corporation. Address: 1540 Eisenhower Place City: Ann Arbor State, Zip: MI, 48108-7080 Phone: 734-971-7080(Tel) 734-971-9022(Fax) Email: JKrenz@trccompanies.com Project Name: Karm/Weadock CCR DEK Bottom Ash Pond & I Site:		Lab PM: Brooks, Kris M E-Mail: Kris.Brooks@Eurofins.com PWSID:		Carrier Tracking No(s): 240-82583-29053.1 State of Origin: Page 1 of 1 Job #:																																					
Due Date Requested: TAT Requested (days): Compliance Project: <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No PO #: TBD WO #:		Analysis Requested <table border="1"> <tr> <th>Sample Identification</th> <th>Sample Date</th> <th>Sample Time</th> <th>Sample Type (C=Comp, G=grab)</th> <th>Matrix (W=water, S=solid, O=water/Oil)</th> <th>Preservation Code:</th> <th>Field Filtered Sample (Yes or No)</th> <th>Form MS/MSD (Yes or No)</th> <th>903.0, Ra226Ra228, GFPC</th> <th>904.0 - Standard Target List</th> <th>Total Number of Containers</th> <th>Special Instructions/Note:</th> </tr> <tr> <td>DEK-MW-15003</td> <td>5-3-21</td> <td>1233</td> <td>G</td> <td>Water</td> <td></td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td></td> <td></td> </tr> <tr> <td>DEK-MW-18001</td> <td>5-3-21</td> <td>1128</td> <td>G</td> <td>Water</td> <td></td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td></td> <td></td> </tr> </table>				Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=grab)	Matrix (W=water, S=solid, O=water/Oil)	Preservation Code:	Field Filtered Sample (Yes or No)	Form MS/MSD (Yes or No)	903.0, Ra226Ra228, GFPC	904.0 - Standard Target List	Total Number of Containers	Special Instructions/Note:	DEK-MW-15003	5-3-21	1233	G	Water		X	X	X	X			DEK-MW-18001	5-3-21	1128	G	Water		X	X	X	X		
Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=grab)	Matrix (W=water, S=solid, O=water/Oil)	Preservation Code:	Field Filtered Sample (Yes or No)	Form MS/MSD (Yes or No)	903.0, Ra226Ra228, GFPC	904.0 - Standard Target List	Total Number of Containers	Special Instructions/Note:																														
DEK-MW-15003	5-3-21	1233	G	Water		X	X	X	X																																
DEK-MW-18001	5-3-21	1128	G	Water		X	X	X	X																																
Possible Hazard Identification <input checked="" type="checkbox"/> Non-Hazard <input type="checkbox"/> Flammable <input type="checkbox"/> Skin Irritant <input type="checkbox"/> Poison B <input type="checkbox"/> Unknown <input type="checkbox"/> Radiological Deliverable Requested: I, II, III, IV, Other (specify)																																									
Sample Disposal (A fee may be assessed if samples are retained longer than 1 month) <input type="checkbox"/> Return To Client <input type="checkbox"/> Disposal By Lab <input type="checkbox"/> Archive For _____ Months																																									
Special Instructions/QC Requirements:																																									
Empty Kit Relinquished by:																																									
Relinquished by: <i>Jacob Krenz</i> Relinquished by: <i>Jacob Krenz</i> Relinquished by:		Date: 5-7-21 / 1537 Date/Time: 5/7/21 1545 Date/Time:		Method of Shipment:																																					
Custody Seals Intact: <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		Cooler Temperature(s) °C and Other Remarks:		Received by: <i>Ulysses</i> Received by: <i>Shawn Cleaver</i> Received by:																																					
Company: TRC Company: ETA Company:		Date/Time: 5/7/21 Date/Time: 5/12/21 Date/Time:		Company: ETA Company: ETA Company:																																					

Eurofins TestAmerica Canton Sample Receipt Form/Narrative			Login # : <u>149195</u>
Canton Facility			
Client <u>Jacob Krenz</u>	Site Name _____		Cooler unpacked by: <u>Trent C</u>
Cooler Received on <u>5/12/21</u>	Opened on <u>5/12/21</u>		
FedEx: 1 st Grd Exp <u>UPS FAS Clipper</u>	Client Drop Off <u>TestAmerica Courier</u>	Other _____	
Receipt After-hours: Drop-off Date/Time		Storage Location	
TestAmerica Cooler # _____	Foam Box _____	Client Cooler _____	Box _____ Other _____
Packing material used: <u>Bubble Wrap</u> Foam Plastic Bag None Other _____			
COOLANT: <u>Wet Ice</u> Blue Ice Dry Ice Water None			
1. Cooler temperature upon receipt		<input type="checkbox"/> See Multiple Cooler Form	
IR GUN# IR-11 (CF +0.1 °C) Observed Cooler Temp. <u>0.8</u> °C Corrected Cooler Temp. <u>0.9</u> °C			
IR GUN #IR-12 (CF +0.2°C) Observed Cooler Temp. _____ °C Corrected Cooler Temp. _____ °C			
2. Were tamper/custody seals on the outside of the cooler(s)? If Yes Quantity _____		<u>Yes</u> No	
-Were the seals on the outside of the cooler(s) signed & dated?		<u>Yes</u> No NA	
-Were tamper/custody seals on the bottle(s) or bottle kits (LLHg/MeHg)?		<u>Yes</u> No	
-Were tamper/custody seals intact and uncompromised?		<u>Yes</u> No NA	
3. Shippers' packing slip attached to the cooler(s)?		<u>Yes</u> No	
4. Did custody papers accompany the sample(s)?		<u>Yes</u> No	
5. Were the custody papers relinquished & signed in the appropriate place?		<u>Yes</u> No	
6. Was/were the person(s) who collected the samples clearly identified on the COC?		<u>Yes</u> No	
7. Did all bottles arrive in good condition (Unbroken)?		<u>Yes</u> No	
8. Could all bottle labels (ID/Date/Time) be reconciled with the COC? <u>TC/5/12</u>		<u>Yes</u> No	
9. For each sample, does the COC specify preservatives (Y/N), # of containers (Y/N), and sample type of grab/comp (Y/N)?		<u>Yes</u> No	
10. Were correct bottle(s) used for the test(s) indicated?		<u>Yes</u> No	
11. Sufficient quantity received to perform indicated analyses?		<u>Yes</u> No	
12. Are these work share samples and all listed on the COC?		<u>Yes</u> No	
If yes, Questions 13-17 have been checked at the originating laboratory.			
13. Were all preserved sample(s) at the correct pH upon receipt?		<u>Yes</u> No NA pH Strip Lot# <u>HC022887</u>	
14. Were VOAs on the COC?		<u>Yes</u> No	
15. Were air bubbles >6 mm in any VOA vials?  ← Larger than this.		<u>Yes</u> No NA	
16. Was a VOA trip blank present in the cooler(s)? Trip Blank Lot # _____		<u>Yes</u> No	
17. Was a LL Hg or Me Hg trip blank present? _____		<u>Yes</u> No	
Contacted PM _____ Date _____ by _____ via Verbal Voice Mail Other _____			
Concerning _____			

Tests that are not checked for pH by Receiving:
 VOAs
 Oil and Grease
 TOC

18. CHAIN OF CUSTODY & SAMPLE DISCREPANCIES <input type="checkbox"/> additional next page		Samples processed by: _____

19. SAMPLE CONDITION
Sample(s) _____ were received after the recommended holding time had expired.
Sample(s) _____ were received in a broken container.
Sample(s) _____ were received with bubble >6 mm in diameter. (Notify PM)

20. SAMPLE PRESERVATION
Sample(s) _____ were further preserved in the laboratory.
Time preserved: _____ Preservative(s) added/Lot number(s): _____
VOA Sample Preservation - Date/Time VOAs Frozen: _____

1
2
3
4
5
6
7
8
9
10
11
12
13
14

Login Sample Receipt Checklist

Client: TRC Environmental Corporation.

Job Number: 240-149195-1

Login Number: 149195

List Number: 2

Creator: Worthington, Sierra M

List Source: Eurofins TestAmerica, St. Louis

List Creation: 05/13/21 11:16 AM

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





**October 2021
Assessment Monitoring
Data Summary and
Statistical Evaluation**

DE Karn, Bottom Ash Pond CCR Unit

Essexville, Michigan

January 2022

A handwritten signature in blue ink that reads "Darby Litz".

Darby Litz
Hydrogeologist/Project Manager

Prepared For:

Consumers Energy Company

Prepared By:

TRC
1540 Eisenhower Place
Ann Arbor, Michigan 48108

A handwritten signature in blue ink that reads "Kristin Lowery".

Kristin Lowery, E.I.T.
Project Engineer

TABLE OF CONTENTS

1.0	Introduction.....	1
1.1	Program Summary	1
1.2	Site Overview	3
1.3	Geology/Hydrogeology	4
2.0	Groundwater Monitoring	6
2.1	Monitoring Well Network.....	6
2.2	October 2021 Assessment Monitoring.....	6
	2.2.1 Groundwater Flow Rate and Direction.....	7
	2.2.2 Data Quality	8
3.0	Assessment Monitoring Statistical Evaluation.....	9
3.1	Establishing Groundwater Protection Standards.....	9
3.2	Data Comparison to Groundwater Protection Standards	9
4.0	Conclusions and Recommendations	11
5.0	References	12

TABLES

Table 1	Summary of Groundwater Elevation Data
Table 2	Summary of Field Parameter Results
Table 3	Summary of Background Wells Groundwater Sampling Results (Analytical)
Table 4	Summary of Groundwater Sampling Results (Analytical)
Table 5	Summary of Groundwater Protection Standard Exceedances – October 2021

FIGURES

Figure 1	Site Location Map
Figure 2	Karn and Weadock Complex Map
Figure 3	Shallow Groundwater Contour Map – October 2021

APPENDICES

Appendix A	Data Quality Reviews
Appendix B	Statistical Evaluation of October 2021 Assessment Monitoring Sampling Event
Appendix C	Groundwater Flow Evaluation
Appendix D	Groundwater Monitoring System Certification
Appendix E	Laboratory Analytical Reports

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 DE Karn Bottom Ash Pond CCR Unit (Karn Bottom Ash Pond).

Consumers Energy is continuing semiannual assessment monitoring in accordance with §257.95 of the CCR Rule for the Karn Bottom Ash Pond located in Essexville, Michigan. This report has been prepared to provide the summary of the October 2021 assessment groundwater monitoring results, data quality review, and statistical data evaluation for the Karn Bottom Ash Pond groundwater monitoring system.

1.1 Program Summary

Groundwater monitoring for the Karn 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 DE Karn Power Plant Bottom Ash Pond CCR Unit* (TRC, January 2018). The statistical evaluation of the Appendix III indicator parameters confirming statistically significant increases (SSIs) over background were as follows:

- Boron at DEK-MW-15001, DEK-MW-15002, DEK-MW-15003, DEK-MW-15004, DEK-MW-15005, DEK-MW-15006;
- Fluoride at DEK-MW-15001;
- Field pH at DEK-MW-15001, DEK-MW-15002, DEK-MW-15003, DEK-MW-15005, DEK-MW-15006; and
- Sulfate at DEK-MW-15006.

On April 25, 2018, Consumers Energy entered assessment monitoring upon determining that an Alternate Source Demonstration for the Appendix III constituents was not successful. After subsequent sampling for Appendix IV constituents, Consumers Energy provided notification that arsenic was present at statistically significant levels above the Ground Water Protection Standards (GWPS) established at 21 ug/L (Consumers Energy, January 2019) in five of the six downgradient monitoring wells at the Karn Bottom Ash Pond as follows:

- Arsenic at DEK-MW-15001, DEK-MW-15002, DEK-MW-15003, DEK-MW-15004, and DEK-MW-15005.

The notification of the GWPS exceedance on January 14, 2019 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 initiated on April 14, 2019 and 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 arsenic concentrations exceed the GWPS in on-site groundwater monitoring locations, arsenic is 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 Karn Bottom Ash Pond. Per §257.96(b), Consumers Energy is continuing to monitor groundwater in accordance with the assessment monitoring program as specified in §257.95.

Evaluation of groundwater under the CCR Rule focused on the following constituents that were 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

Consumers Energy will continue to evaluate corrective measures for the Karn 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 Karn Bottom Ash Pond is located within the DE Karn Power Plant site, which is located north of the JC Weadock Power Plant, east of the Saginaw River, south and west of Saginaw Bay (Figure 1). Two coal-fired power generating units (Karn Units 1 & 2) began generating electricity in 1958 and 1959, respectively. Karn Units 3 & 4, co-located with the coal-fired generating units, are oil- and natural gas-fueled. Two other areas of coal ash management within the Karn site are the Karn Landfill and the Karn Lined Impoundment. The Karn Landfill has been certified closed and is now in post-closure care and is being monitored in accordance with the EGLE-approved *Hydrogeological Monitoring Plan, Rev. 3, DE Karn Solid Waste Disposal Area* (December 19, 2017). The Karn Lined Impoundment has been licensed to operate by the EGLE under Part 115 (License Number 9629) and is being monitored in accordance with the EGLE-approved *Karn Lined Impoundment Hydrogeological Monitoring Plan* (November 13, 2020). The locations of the Karn Landfill, the Karn Lined Impoundment, and the Karn Bottom Ash Pond are shown on Figure 2.

Previously, the Karn Bottom Ash Pond was used for wet ash dewatering and was the primary settling/detention structure for the National Pollutant Discharge Elimination System (NPDES) treatment system prior to discharge. Consumers Energy provided notification of initiation of closure on October 12, 2018 to implement the certified closure plan by removal of CCR under the self-implementing requirements and schedule of the CCR Rule. In preparation for removal of the Karn Bottom Ash Pond, a new lined impoundment (Karn Lined Impoundment) was constructed meeting the requirements of the CCR Rule and the operational needs at the Karn

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.

Power Plant. The Karn Lined Impoundment began receipt of CCR and non-CCR on June 7, 2018 when it replaced the Karn Bottom Ash Pond operations.

Consumers Energy has completed the removal of CCR consistent with the timeline for closure of the Karn Bottom Ash Pond under the *DE Karn Bottom Ash Pond Closure Plan* (Golder, January 2018; Revised April 2018) and the CCR Rule's closure by removal provisions in §257.102(c). Consumers Energy ceased hydraulic loading to the Karn Bottom Ash Pond in June 2018 and allowed the area to dewater by gravity. Consumers Energy then operated a construction dewatering system to allow for excavation of the vertical and lateral extent of CCR that commenced on March 20, 2019 and has operated through the construction and restoration period. 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 Karn 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 constituents of concern (COCs). With the CCR removal complete, Consumers Energy submitted the *DE Karn Generating Facility Bottom Ash Pond CCR Removal Documentation Report* (Golder, October 2019) on October 30, 2019. EGLE approved the documentation removal report on December 1, 2020. Groundwater conditions post-CCR removal continue to be monitored.

1.3 Geology/Hydrogeology

The majority of the Karn 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 (AECOM, 2009).

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 to 30 feet below ground surface (ft bgs) overlying a clay till which is observed at depths ranging from 25 to 75 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. The clay till acts as a hydraulic barrier that separates the shallow groundwater from the underlying sandstone. A sandstone unit, which is part of the Saginaw formation, was generally encountered at 80 to 90 ft bgs.

The DE Karn Power Plant site is bounded by several surface water features (Figure 1): the Saginaw River to the west, Saginaw Bay (Lake Huron) to the north and east, and a discharge channel to the south. In general, shallow groundwater is encountered at a similar or slightly higher elevation relative to the surrounding surface water features. Groundwater flow in the upper aquifer is largely controlled by the surface water elevations of Saginaw River and Saginaw Bay. In the vicinity of the Karn Bottom Ash Pond, the shallow groundwater flow is generally to the west, toward the intake channel.

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 Karn Bottom Ash Pond, which consists of 10 monitoring wells (four background monitoring wells and six downgradient monitoring wells) that are screened in the uppermost aquifer. The monitoring well locations are shown on Figure 2.

Groundwater around the Karn Bottom Ash Pond was initially characterized as radial based on the eight initial background sampling events prior to commencing detection monitoring; therefore, the six downgradient wells (DEK-MW-15001 through DEK-MW-15006) that were installed and spaced along the circumference of the Karn Bottom Ash Pond continued 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. Monitoring well DEK-MW-15001 was decommissioned on April 18, 2018 due to the installation of the new Karn Lined Impoundment, which is a new double composite lined CCR unit constructed as a replacement to the Karn Bottom Ash Pond. Monitoring well DEK-MW-18001 was installed on May 21, 2018 approximately 80 feet southeast of DEK-MW-15001 to maintain the perimeter downgradient monitoring well network.

Groundwater flow direction near the former pond has changed as a result of the pond decommissioning and monitoring wells DEK-MW-15003 and DEK-MW-15004 are no longer located downgradient of the unit (Appendix C). These two wells are being removed from the certified downgradient monitoring well network. The recertification is included in Appendix D.

Four monitoring wells located south of the Karn Bottom Ash Pond on the JC Weadock Power Plant site provide data on background groundwater quality that has not been affected by the 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* for the Karn Bottom Ash Pond, dated October 17, 2017.

2.2 October 2021 Assessment Monitoring

Per §257.95, all wells in the CCR unit groundwater monitoring program must be sampled semiannually. TRC conducted the second semiannual assessment monitoring event of 2021 for Appendix III and IV constituents at the Karn Bottom Ash Pond CCR Unit in accordance with the *DE Karn Monitoring Program Sample Analysis Plan* (ARCADIS, May 2016) (SAP). The semiannual assessment monitoring event was performed on October 4 through 7, 2021.

The October 2021 sampling event included collection of static water level measurements from the Karn Bottom Ash Pond groundwater monitoring system and 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. The Karn Bottom Ash Pond monitoring wells (DEK-MW-15002 through DEK-MW-15006 and DEK-MW-18001) and background monitoring wells (MW-15002, MW-15008, MW-15016, and MW-15019) 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.

The groundwater samples were analyzed by the Consumers Energy Trail Street Laboratory for Appendix III and IV constituents in accordance with the SAP. Radium analyses were completed by Eurofins TestAmerica Inc. (TestAmerica). The analytical results for the background wells are summarized in Table 3, and the analytical results for the downgradient monitoring wells are summarized in Table 4. Analytical results from the October 2021 monitoring event are included in the attached laboratory reports (Appendix E).

2.2.1 Groundwater Flow Rate and Direction

Groundwater elevation data collected during the October 2021 assessment monitoring event are provided in Table 1. These data were used to construct the groundwater contour map (Figure 3). Groundwater elevations measured at the site in October 2021 are generally within the range of 581 to 587 feet above mean sea level (ft NAVD88) and groundwater is typically encountered at equal elevation relative to the surrounding surface water features measured by the NOAA gauging station or within approximately 6 feet higher, flowing toward the bounding surface water features.

Although historically the point source discharge of sluiced bottom ash into the Karn Bottom Ash Pond created localized mounding of the potentiometric surface, the new Karn Lined Impoundment went into service on June 7, 2018 and has been continuously collecting the process water and bottom ash that went into the former bottom ash pond. Since the former bottom ash pond is no longer being hydraulically loaded with sluiced ash and has been dewatered by gravity, the characteristic groundwater mound centered within the pooled area is no longer present. The groundwater elevation data collected from the groundwater monitoring system of the former bottom ash pond in October 2021 demonstrate a reduction in groundwater elevation measurements by several feet when compared to groundwater elevations measured prior to June 2018. Due to the operational changes of the bottom ash pond and the completion of the landfill capping activities, the gradient between the bottom ash pond area and the surrounding surface water bodies is flattening out as compared to previous quarters as the groundwater elevations are reaching a new equilibrium, as expected. Groundwater at the facility is locally influenced by incidental infiltration from precipitation over the uncovered acreage. Monitoring Wells OW-11 and DEK-MW-15003 delineate the newly established groundwater elevation high point with porewater flow generally flowing radially towards the adjacent surface water features from this newly established potentiometric “high”, as illustrated in Figure 3. As such, the groundwater flow across the footprint of the former bottom ash pond is generally to the west.

The average hydraulic gradient observed on October 4, 2021 in the Karn Bottom Ash Pond area during these events is estimated at 0.0042 ft/ft. The gradient was calculated using the monitoring well pairs DEK-MW-15004/DEK-MW-15005 and DEK-MW-15003/DEK-MW-15006, as well as the well water elevation difference and distance between DEK-MW-15003 and the discharge channel. Using the mean hydraulic conductivity of 15 ft/day (ARCADIS, 2016) and an assumed effective porosity of 0.3, the estimated average seepage velocity was 0.21 ft/day or 77 ft/year.

Appendix C includes a series of groundwater contour maps to illustrate the changes in groundwater flow direction from 2015, when the monitoring well network was originally established and background sampling was initiated, to the most recent October 2021 groundwater sampling event. Given this shift in groundwater flow direction, DEK-MW-15003 and DEK-MW-15004 are now located upgradient to side gradient of the CCR unit and are no longer representative of groundwater chemistry downgradient of the Karn Bottom Ash Pond. Therefore, DEK-MW-15003 and DEK-MW-15004 will no longer be used for assessment monitoring or for evaluating the effectiveness of the CCR removal activities.

2.2.2 Data Quality

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 Karn Bottom Ash Pond while Consumers Energy further evaluates corrective measures in accordance with §257.96 and §257.97 as outlined in the ACM. The following section summarizes the statistical approach applied to assess the October 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 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 of any Appendix IV constituent. As documented in the January 14, 2019 *Notification of Appendix IV Constituent Exceeding Groundwater Protection Standard per §257.95(g)*, arsenic was present at statistically significant levels above the federal GWPS in five of the six downgradient wells at the Karn Bottom Ash Pond.

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

Due to changes in groundwater flow direction on site, monitoring wells DEK-MW-15003 and DEK-MW-15004 are no longer located downgradient of the unit and were determined to be no longer indicative of groundwater conditions influenced by the Karn Bottom Ash Pond. Therefore, monitoring wells DEK-MW-15003 and DEK-MW-15004 are no longer included for assessment monitoring statistical analysis. The monitoring well network for statistical evaluation consists of the four monitoring wells located downgradient of the bottom ash pond (DEK-MW-15002, DEK-MW-15005, DEK-MW-15006, and DEK-MW-18001). Overall, the assessment

monitoring statistical evaluations have confirmed that arsenic is the only Appendix IV constituent present at statistically significant levels above the GWPS. The statistical evaluation of the October 2021 semiannual assessment monitoring event data indicate that arsenic is present at statistically significant levels exceeding the GWPS in downgradient monitoring wells at the Karn Bottom Ash Pond:

Constituent	GWPS	#Downgradient Wells Observed
Arsenic	21 ug/L	2 of 4

Previously, arsenic was present in downgradient well DEK-MW-15002 at a statistically significant level; however, the statistical evaluations of the October 2020 through October 2021 data show that the lower confidence limit for arsenic is below the GWPS. A summary of the confidence intervals for October 2021 is provided in Table 5.

Arsenic concentrations at DEK-MW-15002, and DEK-MW-18001 appear to exhibit a downward trend on the time-series chart (Appendix B: 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 showed that arsenic concentrations are generally decreasing with time, as evidenced by the negative Sen’s Slope, and that the downward trend of arsenic at DEK-MW-15002 is statistically significant.

4.0 Conclusions and Recommendations

Corrective action has been triggered and assessment monitoring is ongoing at the Karn Bottom Ash Pond CCR unit. A summary of the October 2021 assessment monitoring event is presented in this report.

Overall, the statistical assessments have confirmed that arsenic is the only Appendix IV constituent present at statistically significant levels above the GWPS. Consumers Energy has completed the removal of CCR consistent with the timeline for closure of the Karn Bottom Ash Pond under the *DE Karn Bottom Ash Pond Closure Plan* (Golder, January 2018; Revised April 2018) and the CCR Rule's closure by removal provisions in §257.102(c).

The ACM Report provided a high-level assessment of groundwater remediation technologies that could potentially address site-specific COCs (i.e., arsenic) under known groundwater conditions. Groundwater chemistry already appears to be improving as a result of discontinuing the hydraulic loading to the Karn Bottom Ash Pond and the completed source removal of CCR, as shown by the decreasing concentrations of arsenic at DEK-MW-15002 and DEK-MW-18001; however, attainment of the GWPS at all of the Bottom Ash Pond compliance wells may not be feasible due to influences other than the former pond, such as the presence and former operation of the nearby Karn Landfill. Redox conditions, which affect contaminant transport, are still stabilizing following pond removal and will continue to be evaluated further.

Consumers Energy will continue assessment monitoring and evaluate corrective measures in accordance with §257.96 and §257.97 as outlined in the Karn Bottom Ash Pond ACM. The groundwater management remedy for the Karn Bottom Ash Pond will be selected as soon as feasible to meet the federal standards of §257.96(b) of the CCR Rule. Consumers Energy will continue executing the self-implementing groundwater compliance schedule in conformance with §257.90 - §257.98. The next semiannual monitoring event is tentatively scheduled for the second calendar quarter of 2022.

5.0 References

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Tables

Table 1
 Summary of Groundwater Elevation Data
 DE Karn – RCRA CCR Monitoring Program
 Essexville, Michigan

Well Location	TOC Elevation (ft)	Geologic Unit of Screen Interval	Screen Interval Elevation (ft)	October 4, 2021	
				Depth to Water (ft BTOC)	Groundwater Elevation (ft)
Background					
MW-15002	587.71	Sand	580.9 to 570.9	6.68	581.03
MW-15008	585.36	Sand with clay	578.7 to 568.7	4.28	581.08
MW-15016	586.49	Sand	581.2 to 578.2	3.85	582.64
MW-15019	586.17	Sand and Sand/Clay	579.5 to 569.5	5.20	580.97
DEK Bottom Ash Pond					
DEK-MW-15002	590.87	Sand	578.3 to 575.3	6.38	584.49
DEK-MW-15004	611.04	Sand	576.6 to 571.6	27.88	583.16
DEK-MW-15005	589.72	Sand	572.3 to 567.3	8.81	580.91
DEK-MW-15006	589.24	Sand	573.0 to 568.0	8.28	580.96
DEK Bottom Ash Pond & Karn Lined Impoundment					
DEK-MW-15003	602.74	Sand	578.8 to 574.8	16.50	586.24
DEK-MW-18001	593.47	Sand	579.2 to 574.2	8.43	585.04
OW-10	591.58	Silty Sand and Silty Clay	576.0 to 571.0	6.48	585.10
OW-11	607.90	Silt/Fly Ash	587.5 to 582.5	21.66	586.24
OW-12	603.07	Silty Sand	584.2 to 579.2	17.10	585.97
DEK Nature and Extent					
MW-01	597.02	Sand	573.0 to 570.0	16.24	580.78
MW-03	597.30	Sand	569.8 to 566.8	16.51	580.79
MW-06	589.44	Sand and Silty Sand	578.5 to 563.5	8.60	580.84
MW-08	598.78	Sand and Silty Clay	580.9 to 570.9	17.38	581.40
MW-10	596.97	Sand	582.5 to 572.5	15.95	581.02
MW-12	598.60	Sand	583.9 to 573.9	17.75	580.85
MW-14	594.37	Sand and Silty Clay	584.7 to 574.7	13.63	580.74
MW-16	595.80	Sand and Sand/Bottom Ash	584.1 to 574.1	14.90	580.90
MW-22	598.99	Ash/Sand	571.4 to 568.4	16.54	582.45
MW-23	595.57	Ash/Sand	576.9 to 571.9	13.35	582.22
DEK Static Water Level					
MW-02	597.34	Sand and Silty Clay	572.5 to 567.5	16.56	580.78
MW-04	598.01	NR	569.5 to 564.5	17.22	580.79
MW-17	597.91	Sand	577.0 to 574.0	12.95	584.96
MW-18	609.22	Silty Sand and Silty Clay	575.8 to 573.8	25.25	583.97
MW-19	597.28	NR	572.1 to 567.1	16.20	581.08
MW-20	632.75	Sand	582.3 to 579.3	52.02	580.73
MW-21	632.91	Sand	587.1 to 584.1	50.72	582.19
OW-01	631.33	NR	572.5 to 567.5	50.63	580.70
OW-02	598.01	Fly Ash	579.4 to 576.4	15.36	582.65
OW-03	597.94	Fly Ash and Sand	573.6 to 568.6	17.47	580.47
OW-04	590.21	Sand and Bottom/Fly Ash	579.1 to 574.1	9.60	580.61
OW-05	593.53	Sand	576.9 to 571.9	11.10	582.43
OW-06	603.95	NR	580.9 to 575.9	21.38	582.57
OW-07	596.41	Ash	583.3 to 580.3	14.28	582.13
OW-08	593.93	NR	581.0 to 576.0	10.74	583.19
OW-09	593.45	NR	585.5 to 580.5	10.23	583.22
OW-13	588.52	NR	579.5 to 574.5	3.96	584.56
OW-15	587.75	NR	572.8 to 567.8	3.90	583.85

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.

NR: Not Recorded

Table 2
 Summary of Field Parameters: October 2021
 DE Karn Bottom Ash Pond – 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	10/7/2021	0.50	-101.9	7.0	919	16.5	3.2
MW-15008	10/6/2021	0.46	-93.6	6.6	1,202	16.0	10.7
MW-15016	10/7/2021	0.54	-71.2	6.9	1,498	17.4	1.5
MW-15019	10/7/2012	0.48	-72.2	6.4	1,829	15.2	1.2
Karn Bottom Ash Pond							
DEK-MW-15002	10/4/2021	0.41	-116.2	7.1	884	15.6	1.6
DEK-MW-15003	10/7/2021	0.57	-210.3	8.3	461	20.8	2.0
DEK-MW-15004	10/4/2021	0.49	-125.6	7.1	698	15.6	1.4
DEK-MW-15005	10/4/2021	0.40	-103.7	7.1	724	14.3	1.6
DEK-MW-15006	10/4/2021	0.35	-100.0	7.3	925	14.8	3.8
DEK-MW-18001	10/7/2021	0.29	-158.5	7.4	850	14.3	2.2

Notes:

mg/L - Milligrams per Liter.

mV - Millivolts.

SU - Standard units.

umhos/cm - Micromhos per centimeter.

°C - Degrees Celsius

NTU - Nephelometric Turbidity Unit.

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

		Sample Location:				MW-15002	MW-15008	MW-15016	MW-15019
		Sample Date:				10/7/2021	10/6/2021	10/7/2021	10/7/2021
Constituent	Unit	EPA MCL	MI Residential*	MI Non-Residential*	MI GSI^	Background			
Appendix III⁽¹⁾									
Boron	ug/L	NC	500	500	4,000	51	204	661	351
Calcium	mg/L	NC	NC	NC	500 ^{EE}	76.8	116	236	165
Chloride	mg/L	250**	250^E	250^E	50	146	197	138	363
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}	3.76	11.6	433	58.3
Total Dissolved Solids	mg/L	500**	500^E	500^E	500	290	810	1,140	1,130
pH, Field	SU	6.5 - 8.5**	6.5 - 8.5^E	6.5 - 8.5^E	6.5 - 9.0	7.0	6.6	6.9	6.4
Appendix IV⁽¹⁾									
Antimony	ug/L	6	6.0	6.0	2.0	< 1	< 1	< 1	< 1
Arsenic	ug/L	10	10	10	10	3	3	8	3
Barium	ug/L	2,000	2,000	2,000	1,200	85	65	63	283
Beryllium	ug/L	4	4.0	4.0	33	< 1	< 1	< 1	< 1
Cadmium	ug/L	5	5.0	5.0	2.5	< 0.2	< 0.2	< 0.2	< 0.2
Chromium	ug/L	100	100	100	11	< 1	2	< 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	4.0	4.0	14	< 1	< 1	< 1	< 1
Lithium	ug/L	NC	170	350	440	< 10	30	85	15
Mercury	ug/L	2	2.0	2.0	0.20 [#]	< 0.2	< 0.2	< 0.2	< 0.2
Molybdenum	ug/L	NC	73	210	120	< 5	< 5	7	< 5
Radium-226	pCi/L	NC	NC	NC	NC	0.775	1.05	0.934	1.42
Radium-228	pCi/L	NC	NC	NC	NC	< 0.582	1.11	< 0.478	< 0.424
Radium-226/228	pCi/L	5	NC	NC	NC	1.00	2.16	1.33	1.72
Selenium	ug/L	50	50	50	5.0	< 1	< 1	2	< 1
Thallium	ug/L	2	2.0	2.0	2.0	< 2	< 2	< 2	< 2
Additional MI Part 115⁽²⁾									
Iron	ug/L	300**	300^E	300^E	500,000 ^{EE}	2,810	14,500	2,670	20,900
Copper	ug/L	1,000**	1,000 ^E	1,000 ^E	20	< 1	< 1	1	< 1
Nickel	ug/L	NC	100	100	120	4	6	14	7
Silver	ug/L	100**	34	98	0.2	< 0.2	< 0.2	< 0.2	< 0.2
Vanadium	ug/L	NC	4.5	62	27	< 2	6	< 2	2
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.

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

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

NC - no criteria.

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

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

^ - Michigan Part 201 Groundwater Surface Water Interface (GSI) Criteria. Hardness-dependent criteria calculated using 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): October 2021
 DE Karn Bottom Ash Pond – RCRA CCR Monitoring Program
 Essexville, Michigan

		Sample Location:				DEK-MW-15002	DEK-MW-15003	DEK-MW-15004	DEK-MW-15005	DEK-MW-15006	DEK-MW-18001
		Sample Date:				10/4/2021	10/7/2021	10/4/2021	10/4/2021	10/4/2021	10/7/2021
Constituent	Unit	EPA MCL	MI Residential*	MI Non-Residential*	MI GSI^	downgradient	upgradient	downgradient	downgradient	downgradient	
Appendix III⁽¹⁾											
Boron	ug/L	NC	500	500	4,000	1,530	976	1,120	991	1,050	1,370
Calcium	mg/L	NC	NC	NC	500 ^{EE}	73.1	24.5	65.8	102	117	71
Chloride	mg/L	250**	250 ^E	250 ^E	50	102	54	64	82.3	78.9	55.2
Fluoride	ug/L	4,000	NC	NC	NC	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	250**	250 ^E	250 ^E	500 ^{EE}	58.3	39.7	143	57.2	209	118
Total Dissolved Solids	mg/L	500**	500^E	500^E	500	599	253	530	546	712	494
pH, Field	SU	6.5 - 8.5**	6.5 - 8.5 ^E	6.5 - 8.5 ^E	6.5 - 9.0	7.1	8.3	7.1	7.1	7.3	7.4
Appendix IV⁽¹⁾											
Antimony	ug/L	6	6.0	6.0	2.0	< 1	< 1	< 1	< 1	< 1	< 1
Arsenic	ug/L	10	10	10	10	2	481	170	68	23	85
Barium	ug/L	2,000	2,000	2,000	1,200	102	42	102	192	125	135
Beryllium	ug/L	4	4.0	4.0	33	< 1	< 1	< 1	< 1	< 1	< 1
Cadmium	ug/L	5	5.0	5.0	2.5	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium	ug/L	100	100	100	11	1	< 1	< 1	< 1	< 1	< 1
Cobalt	ug/L	NC	40	100	100	< 6	< 6	< 6	< 6	< 6	< 6
Fluoride	ug/L	4,000	NC	NC	NC	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	4.0	4.0	14	< 1	< 1	< 1	< 1	< 1	< 1
Lithium	ug/L	NC	170	350	440	29	19	35	41	19	24
Mercury	ug/L	2	2.0	2.0	0.20#	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Molybdenum	ug/L	NC	73	210	120	< 5	28	9	7	7	< 5
Radium-226	pCi/L	NC	NC	NC	NC	1.47	0.838	1.74	1.12	0.797	0.873
Radium-228	pCi/L	NC	NC	NC	NC	0.827	< 0.466	1.23	0.940	0.704	0.979
Radium-226/228	pCi/L	5	NC	NC	NC	2.29	1.03	2.97	2.06	1.50	1.85
Selenium	ug/L	50	50	50	5.0	3	1	2	2	2	2
Thallium	ug/L	2	2.0	2.0	2.0	< 2	< 2	< 2	< 2	< 2	< 2
Additional MI Part 115⁽²⁾											
Iron	ug/L	300**	300^E	300^E	500,000 ^{EE}	128	103	2,440	916	1,300	1,190
Copper	ug/L	1,000**	1,000 ^E	1,000 ^E	20	< 1	< 1	< 1	< 1	< 1	< 1
Nickel	ug/L	NC	100	100	120	4	< 2	3	6	11	4
Silver	ug/L	100**	34	98	0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Vanadium	ug/L	NC	4.5	62	27	< 2	< 2	< 2	< 2	< 2	< 2
Zinc	ug/L	5,000**	2,400	5,000 ^E	260	< 10	< 10	< 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 21, 2020.

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

^ - Michigan Part 201 Groundwater Surface Water Interface (GSI) Criteria. Hardness-dependent criteria calculated using 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 – October 2021
 DE Karn Bottom Ash Pond – RCRA CCR Monitoring Program
 Essexville, Michigan

Constituent	Units	GWPS	DEW-MW-15002		DEK-MW-15005		DEK-MW-15006		DEK-MW-18001	
			LCL	UCL	LCL	UCL	LCL	UCL	LCL	UCL
Arsenic	ug/L	21	2.0	29	24	78	21	27	63	230

Notes:

ug/L - micrograms per Liter.

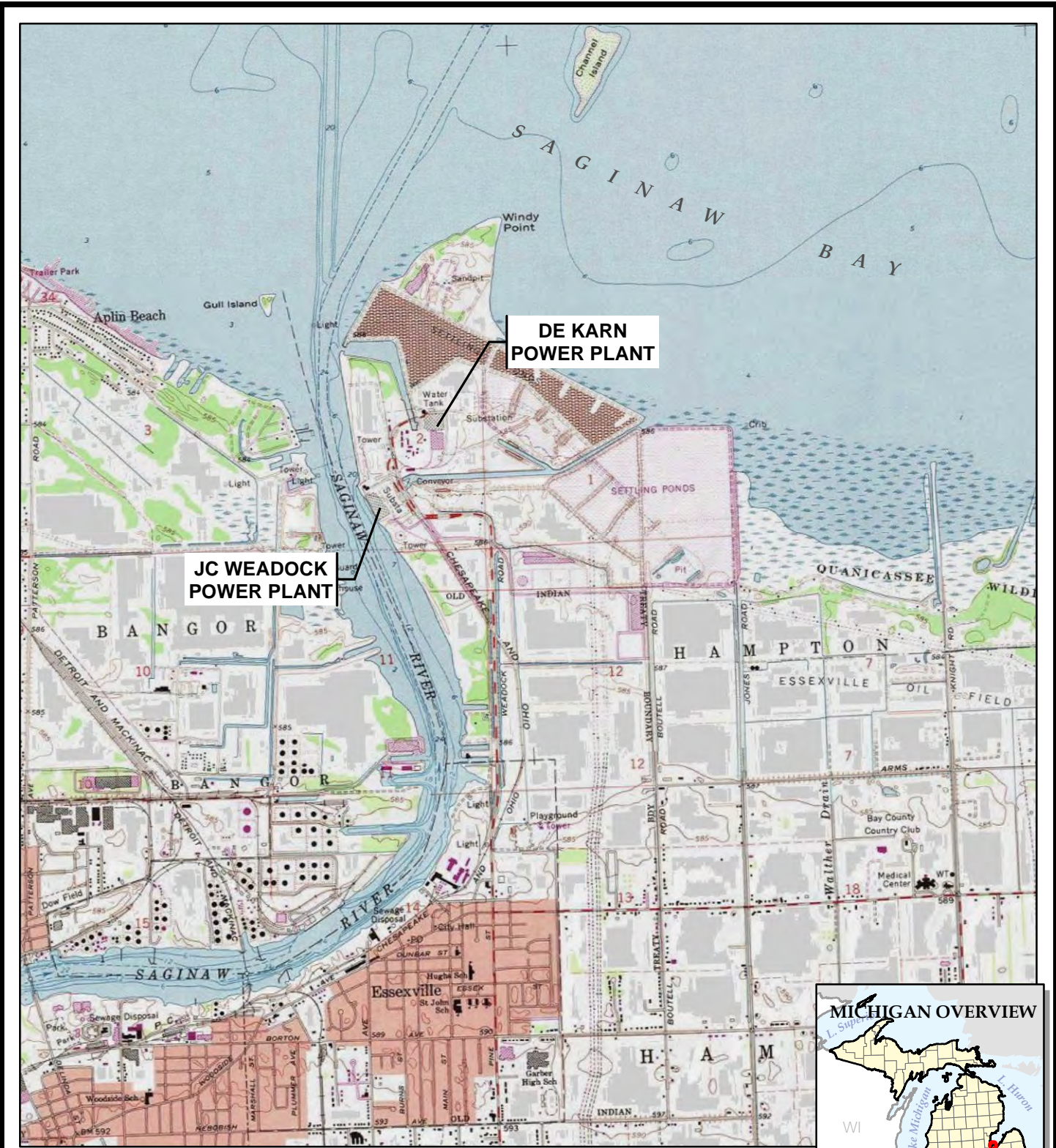
GWPS - Groundwater Protection Standard as established in TRC's Technical Memorandum dated October 15, 2018.

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

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

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

Figures



BASE MAP FROM USGS 7.5 MINUTE TOPOGRAPHIC QUADRANGLE SERIES.



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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:	S. MAJOR
CHECKED BY:	J. KRENZ
APPROVED BY:	D. LITZ
DATE:	JULY 2020
PROJ. NO.:	367388.0001
FILE:	367388-001-004.mxd

FIGURE 1

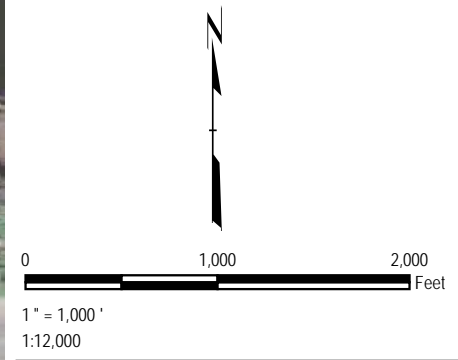


LEGEND

- BACKGROUND MONITORING WELL
- DEK BOTTOM ASH POND MONITORING WELL
- DEK LINED IMPOUNDMENT MONITORING WELL
- DECOMMISSIONED MONITORING WELL
- JCW BOTTOM ASH POND MONITORING WELL
- JCW LANDFILL CCR WELL
- MONITORING WELL (STATIC WATER LEVEL ONLY)
- LEACHATE HEADWELL
- SURFACE WATER GAUGING STATION
- NATURE AND EXTENT WELL
- SLURRY WALL (APPROXIMATE)
- LINED IMPOUNDMENT (COVENANT BOUNDARY)

NOTES

1. BASE MAP IMAGERY FROM GOOGLE EARTH PRO, 2018.
2. WELL LOCATIONS SURVEYED BY ROWE PROFESSIONAL SERVICES COMPANY ON 11/4/2015.
3. NOAA/NATIONAL OCEANIC SERVICE GREAT LAKES GAUGING STATION, ESSEXVILLE, MI (ID: 9075035).
4. A SINGLE WELL SYMBOL IS SHOWN FOR WELL PAIRS MW-01/MW-02, MW-03/MW-04, OW-02/MW-22, AND OW-07/MW-23 AS THE WELLS ARE LOCATED WITHIN 15-FT OF EACH OTHER.



PROJECT:		CONSUMERS ENERGY COMPANY DE KARN AND JC WEADOCK POWER PLANTS ESSEXVILLE, MICHIGAN	
TITLE:		KARN AND WEADOCK COMPLEX AREA	
DRAWN BY:	R. BARBER	PROJ NO.:	367388-001
CHECKED BY:	K. LOWERY	FIGURE 2	
APPROVED BY:	D. LITZ		
DATE:	JANUARY 2022		
		1540 Eisenhower Place Ann Arbor, MI 48108-3284 Phone: 734.971.7080 www.trccompanies.com	
FILE NO.:		367388-001-005.mxd	


Plot Date: 1/7/2022 13:06:45 PM by BTRACY -- LAYOUT: ANSIB(11"x17")
 Path: S:\11-PROJECTS\Consumers Energy Company\Michigan\CCR_GW\2017-26976711-DEKARN\2021_MXD\2021_004_OCTOBER\418426-501-003.mxd
 Coordinate System: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl (Foot)
 Map Rotation: 0
 TRC - GIS

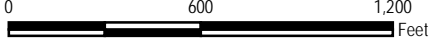


LEGEND

- DEK BOTTOM ASH POND MONITORING WELL
- DEK LINED IMPOUNDMENT MONITORING WELL
- DECOMMISSIONED MONITORING WELL
- MONITORING WELL (STATIC WATER LEVEL ONLY)
- SURFACE WATER GAUGING STATION
- NATURE AND EXTENT WELL
- SLURRY WALL (APPROXIMATE)
- LINED IMPOUNDMENT (COVENANT BOUNDARY)
- GROUNDWATER ELEVATION CONTOUR (1' INTERVAL, DASHED WHERE INFERRED)
- (580.50) GROUNDWATER ELEVATION (FEET)

- ### NOTES
- BASE MAP IMAGERY FROM GOOGLE EARTH PRO, 2018.
 - WELL LOCATIONS SURVEYED BY ROWE PROFESSIONAL SERVICES COMPANY ON 11/4/2015.
 - NOAA/NATIONAL OCEANIC SERVICE GREAT LAKES GAUGING STATION, ESSEXVILLE, MI (ID: 9075035).
 - GROUNDWATER ELEVATIONS DISPLAYED IN FEET RELATIVE TO THE NORTH AMERICAN VERTICAL DATUM OF 1988.





 1" = 600'
 1:7,200

PROJECT:		CONSUMERS ENERGY COMPANY DE KARN POWER PLANT ESSEXVILLE, MICHIGAN	
TITLE:		SHALLOW GROUNDWATER CONTOUR MAP OCTOBER 2021	
DRAWN BY:	A. ADAIR	PROJ NO.:	418425.0001
CHECKED BY:	J. KRENZ	FIGURE 3	
APPROVED BY:	D. LITZ		
DATE:	JANUARY 2022		



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FILE NO.: 418426-501-003.mxd

Appendix A

Data Quality Reviews

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

Groundwater samples were collected by TRC for the October 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 radium analyses were subcontracted to Eurofins-TestAmerica in St. Louis, Missouri (Eurofins TA – St. Louis). The laboratory analytical results were reported in laboratory sample delivery groups (SDGs) 21-1171 and 240-157750-1.

During the October 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
Radium (Ra-226, Ra-228, Combined Ra-226 & Ra-228)	EPA 903.0, EPA 904.0

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

Data Usability Review Procedure

The analytical data were reviewed using the USEPA National Functional Guidelines for Inorganic Superfund Data Review (USEPA, 2020) and the Department of Energy Evaluation of Radiochemical Data Usability (USDOE, 1997). The following items were included in the evaluation of the data:

- Sample receipt, as noted in the cover page or case narrative;
- Technical holding times for analyses;
- Reporting limits (RLs) compared to project-required RLs;
- Data for method blanks, 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;
- Percent recoveries for carriers, where applicable, for radiochemistry only. Carriers are used to assess the chemical yield for the preparation and/or instrument efficiency;
- Data for laboratory duplicates, when performed on project samples. The laboratory duplicates are replicate analyses of one sample and are used to assess the precision of the analytical method;
- Data for blind field duplicates. Field duplicate samples are used to assess variability introduced by the sampling and analytical processes; and
- Overall usability of the data.

It should be noted that results for method blanks and laboratory control samples were not provided for review by 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, IV, optional Piper Diagram analyses, and additional Part 115 constituents will be utilized for the purposes of the assessment monitoring program.
- Data are usable for the purposes of the assessment monitoring program.
- When the data are evaluated through an assessment monitoring statistical program, findings below may be used to support the removal of outliers.

QA/QC Sample Summary

- A method blank was analyzed with each analytical batch for radium. Radium was not detected in the method blanks.
- One equipment blank (EB-04) and one field blank (FB-MW-15002) were collected. Total metals and anions were not detected in the field blank sample. Radium 226 (0.666 pCi/L), radium 228 (0.649 pCi/L), and combined radium (1.31 pCi/L) were detected in EB-04; positive detections for radium 226, radium 228, and combined radium in groundwater

samples are potentially false positive results as summarized in the attached table, Attachment 1.

- The LCS/LCSD recoveries and relative percent differences (RPDs) for the radium analyses were within QC limits with the following exception. The percent recovery for radium 228 (127%) in LCS 160-531998/1-A was above the acceptance criteria (72-125%); therefore, positive detections for radium 228 in groundwater samples are potentially biased high as summarized in the attached table, Attachment 1.
- MS and MSD analyses were not performed on a sample from this data set.
- The field duplicate pair samples were DUP-Background/DUP-04 and MW-15019; all criteria were met.
- Laboratory duplicate analyses were not performed on a sample from this data set.
- Carrier recoveries, where applicable, were within 40-110%.

Attachment 1

Summary of Data Non-Conformances for Porewater Analytical Data
DE Karn & JC Weadock – Background Wells
Essexville, Michigan

Samples	Collection Date	Analyte	Non-Conformance/Issue
MW-15002	10/7/2021	Radium 226, Combined Radium	Potential false positive results due to equipment blank contamination.
MW-15008	10/6/2021		
MW-15016	10/7/2021		
MW-15019	10/7/2021		
DUP-04	10/7/2021		
MW-15008	10/6/2021	Radium 228	Potential false positive results due to equipment blank contamination.
EB-04	10/7/2021	Radium 228	Percent recovery in LCS above criteria; results are potentially biased high.
MW-15008	10/6/2021		

Laboratory Data Quality Review Groundwater Monitoring Event October 2021 DE Karn Bottom Ash Pond and Lined Impoundment

Groundwater samples were collected by TRC for the October 2021 sampling event. Samples were analyzed for total metals, anions, total dissolved solids, and alkalinity by Consumers Energy (CE) Laboratory Services in Jackson, Michigan. The radium analyses were subcontracted to Eurofins-TestAmerica in St. Louis, Missouri (Eurofins TA – St. Louis). The laboratory analytical results were reported in laboratory sample delivery groups (SDGs) 21-1169 and 240-157754-1.

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

- DEK-MW-15003
- DEK-MW-18001

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

Analyte Group	Method
Anions (Fluoride, Chloride, Sulfate)	EPA 300.0
Total Dissolved Solids (TDS)	SM 2540C
Total Metals	SW-846 6020B/7470A
Alkalinity (Bicarbonate, Carbonate, and Total)	SM 2320B
Radium (Ra-226, Ra-228, Combined Ra-226 & Ra-228)	EPA 903.0, EPA 904.0

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

Data Usability Review Procedure

The analytical data were reviewed using the USEPA National Functional Guidelines for Inorganic Superfund Methods Data Review (USEPA, 2020) and the Department of Energy Evaluation of Radiochemical Data Usability (USDOE, 1997). The following items were included in the evaluation of the data:

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

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

It should be noted that results for method blanks and LCSs were not provided for review by CE Laboratory Services. Therefore, potential contamination arising from laboratory sample preparation and/or analytical procedures and the accuracy of the analytical method using a clean matrix could not be evaluated for the 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, IV, optional Piper Diagram analyses, and additional Part 115 constituents will be utilized for the purposes of a detection or assessment monitoring program.
- Data are usable for the purposes of the detection or assessment monitoring program.
- When the data are evaluated through a detection or assessment monitoring statistical program, findings below may be used to support the removal of outliers.

QA/QC Sample Summary

- A method blank was analyzed with each analytical batch for radium. Radium was not detected in the method blanks.
- A field blank was not collected with this data set.
- An equipment blank was not collected with this data set.
- The LCS/LCSD recoveries and relative percent differences (RPDs) for the radium analyses were within QC limits with the following exception. The percent recovery for radium 228

(127%) in LCS 160-531998/1-A was above the acceptance criteria (75-125%); therefore, the positive detection of radium 228 in sample DEK-MW-18001 is potentially biased high as summarized in the attached table, attachment 1.

- MS and MSD analyses were performed on sample DEK-MW-18001 for total metals, anions, and alkalinity. The recoveries were within the acceptance limits. RPDs were not provided by the laboratory (CE) 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.
- A field duplicate pair was not collected with this data set.
- Laboratory duplicate analyses were not performed on a sample from this data set.
- Carrier recoveries, where applicable, were within 40-110%.

Attachment 1

Summary of Data Non-Conformances for Groundwater Analytical Data
DE Karn Bottom Ash Pond and Lined Impoundment – RCRA CCR Monitoring Program
Essexville, Michigan

Samples	Collection Date	Analyte	Non-Conformance/Issue
DEK-MW-18001	10/7/2021	Radium 228	Percent recovery in LCS above criteria; result is potentially biased high.

Laboratory Data Quality Review Groundwater Monitoring Event October 2021 DE Karn Bottom Ash Pond

Groundwater samples were collected by TRC for the October 2021 sampling event. Samples were analyzed for total metals, anions, total dissolved solids, and alkalinity by Consumers Energy (CE) Laboratory Services in Jackson, Michigan. The radium analyses were subcontracted to Eurofins-TestAmerica in St. Louis, Missouri (Eurofins TA – St. Louis). The laboratory analytical results were reported in laboratory sample delivery groups (SDGs) 21-1168R and 240-157688-1 Revision 1.

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

- DEK-MW-15002
- DEK-MW-15004
- DEK-MW-15005
- DEK-MW-15006

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

Analyte Group	Method
Anions (Fluoride, Chloride, Sulfate)	EPA 300.0
Total Dissolved Solids (TDS)	SM 2540C
Total and Dissolved Metals	SW-846 6020B/7470A
Alkalinity (Bicarbonate, Carbonate, and Total)	SM 2320B
Radium (Ra-226, Ra-228, Combined Ra-226 & Ra-228)	EPA 903.0, EPA 904.0

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

Data Usability Review Procedure

The analytical data were reviewed using the USEPA National Functional Guidelines for Inorganic Superfund Methods Data Review (USEPA, 2020) and the Department of Energy Evaluation of Radiochemical Data Usability (USDOE, 1997). The following items were included in the evaluation of the data:

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

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

It should be noted that results for method blanks and LCSs were not provided for review by CE Laboratory Services. Therefore, potential contamination arising from laboratory sample preparation and/or analytical procedures and the accuracy of the analytical method using a clean matrix could not be evaluated for the 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 the detection monitoring program.
- Data are usable for the purposes of the assessment monitoring program.
- When the data are evaluated through an assessment monitoring statistical program, findings below may be used to support the removal of outliers.

QA/QC Sample Summary:

- A method blank was analyzed with each analytical batch for radium. Radium was not detected in the method blanks.
- One field blank (FB-DEK-BAP) was collected. Total metals were not detected in the blank sample.
- An equipment blank was not collected with this data set.
- The LCS/LCSD recoveries and relative percent differences (RPDs) for the radium analyses were within QC limits with the following exception. The percent recovery for radium 228

(127%) in LCS 160-531998/1-A was above the acceptance criteria (75-125%); therefore, positive detections for radium 228 in all groundwater samples are potentially biased high as summarized in the attached table, attachment 1.

- MS and MSD analyses were not performed on a sample from this data set.
- The field duplicate pair samples were DUP-DEK-BAP with DEK-MW-15006; relative percent differences (RPDs) between the parent and duplicate sample were within the QC limits.
- Laboratory duplicate analyses were not performed on a sample from this data set.
- Carrier recoveries, where applicable, were within 40-110%.

Attachment 1
 Summary of Data Non-Conformances for Groundwater Analytical Data
 DE Karn Bottom Ash Pond – RCRA CCR Monitoring Program
 Essexville, Michigan

Samples	Collection Date	Analyte	Non-Conformance/Issue
DEK-MW-15002	10/4/2021	Radium 228	Percent recovery in LCS above criteria; results are potentially biased high.
DEK-MW-15004	10/4/2021		
DEK-MW-15005	10/4/2021		
DEK-MW-15006	10/4/2021		
DUP-DEK-BAP	10/4/2021		

Appendix B
Statistical Evaluation of October 2021
Assessment Monitoring Sampling Event

Technical Memorandum

Date: January 28, 2022

To: J.R. Register, Consumers Energy

From: Darby Litz, TRC
Alex Eklund, TRC

Project No.: 418425.0001.0000 Phase 002, Task 002

Subject: Statistical Evaluation of October 2021 Assessment Monitoring Sampling Event
DE Karn Bottom Ash Pond, Consumers Energy Company, Essexville, Michigan

During the statistical evaluation of the initial assessment monitoring event (May 2018), arsenic was 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 DE Karn Power Plant Bottom Ash Pond (Karn Bottom Ash Pond).

An assessment monitoring event was conducted on October 4 through 7, 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 statistical evaluation of the assessment monitoring event data indicates the following constituent is present at statistically significant levels exceeding the GWPS in downgradient monitoring wells at the Karn Bottom Ash Pond:

Constituent	GWPS	#Downgradient Wells Observed
Arsenic	21 ug/L	2 of 4

The results of the assessment monitoring statistical evaluation for the downgradient wells are consistent with the results of the previous assessment monitoring data statistical evaluations, indicating that arsenic is the only constituent present at concentrations above the GWPS. Consumers Energy will continue to evaluate corrective measures per §257.96 and §257.97. Consumers Energy will continue

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).

Technical Memorandum

executing the self-implementing groundwater compliance schedule in conformance with §257.90 - §257.98.

Assessment Monitoring Statistical Evaluation

When the initial assessment monitoring event was completed in May 2018, the compliance well network at the Karn Bottom Ash Pond included six wells encircling the unit (DEK-MW-15002 through DEK-MW-15006 and DEK-MW-18001). Starting with the May 2021 statistical evaluation, the compliance well network includes DEK-MW-15002, DEK-MW-15005, DEK-MW-15006, and DEK-MW-18001. Due to changes in groundwater flow direction on site, monitoring wells DEK-MW-15003 and DEK-MW-15004 are no longer located downgradient of the unit and were determined to be no longer indicative of groundwater conditions influenced by the Karn Bottom Ash Pond. Therefore, monitoring wells DEK-MW-15003 and DEK-MW-15004 are no longer included for statistical analysis.

Following the assessment monitoring sampling event, compliance well data for the DEK BAP 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 Guidance², the preferred method for comparisons to a fixed standard is confidence limits. Based on the number of historical observations in the representative sample population, the sample mean, the sample standard deviation, and a selected confidence level (i.e., 99 percent), an upper and lower confidence limit is calculated. The true mean 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 exceedance of the GWPS within the past eight sampling events (May 2018 through October 2021) were retained for further analysis. Arsenic in each of the downgradient monitoring wells at the Karn

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

Technical Memorandum

Bottom Ash Pond had individual results exceeding the GWPS. Lead was detected in DEK-MW-15006 during May 2018 at a concentration of 320 ug/L, which exceeds its GWPS. However, this is the only detection of lead in the Bottom Ash Pond wells during either baseline sampling or assessment monitoring. Sampling conducted in November 2018 did not confirm the lead detection. Therefore, the single detection was classified as an outlier per the Double Quantification Rule as outlined in the Stats Plan and the Unified Guidance. As a result, only arsenic was retained for evaluation in all downgradient monitoring wells.

Groundwater data were then evaluated utilizing Sanitas™ statistical software. Sanitas™ is a software tool that is commercially available for performing statistical evaluation consistent with procedures outlined in the Unified Guidance. Within the Sanitas™ statistical program, confidence limits were selected to perform the statistical comparison of compliance data to a fixed standard. Parametric and non-parametric confidence intervals were calculated for each of the CCR Appendix IV constituents using a using a per test³ 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 (May 2018 through October 2021) were visually assessed for potential trends. No outliers were identified. Arsenic concentrations at DEK-MW-15002 and DEK-MW-18001 appear to exhibit a downward trend on the time-series chart (Attachment 1). These two 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 showed that arsenic concentrations at DEK-MW-15002 and DEK-MW-18001 are generally decreasing with time, as evidenced by the negative Sen's Slope. Additionally, the decrease in concentrations at DEK-MW-15002 was shown to be statistically significant and arsenic concentrations have been below the GWPS for the six most recent sampling events (Attachment 1). The decreases in arsenic concentrations at DEK-MW-15002 and DEK-MW-18001 are causing the

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

Technical Memorandum

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. Arsenic concentrations have already triggered assessment monitoring (e.g., not a newly identified GWPS exceedance) and an interim measure has been initiated through the removal of CCR from the bottom ash pond in 2019; therefore, traditional confidence interval calculations are presented in this statistical evaluation until more post-CCR removal data are available. If trends continued to be observed as additional post-CCR removal data are collected, 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, and as of the October 2021 event, five semi-annual sampling events have been completed post-CCR removal.

The Sanitas™ software was 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 UG 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 for well/constituent pairs with a direct GWPS exceedance 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 graph for the confidence intervals of each well. The arsenic data set at DEK-MW-15006 was found to be normally distributed, DEK-MW-15005 was normalized using a cube root transformation, DEK-MW-15002 was normalized using a natural log transformation, and DEK-MW-18001 used a non-parametric confidence interval due to non-normal data set. The confidence interval test compares the lower confidence limit to the GWPS. The statistical evaluation of the Appendix IV parameters shows exceedances for arsenic at two of the four monitoring locations (DEK-MW-15005 and DEK-MW-18001). The results of the assessment monitoring statistical evaluation for the other downgradient wells are consistent with the results of the previous assessment monitoring data statistical evaluations, indicating that arsenic is the only constituent present at concentrations above the GWPS. 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 – May 2018 to October 2021

Attachment 1 Sanitas™ Output Files

Table

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

		Sample Location:				DEK-MW-15002									
		Sample Date:				5/23/2018	11/5/2018	4/11/2019	10/15/2019	5/13/2020	10/6/2020	10/6/2020	5/3/2021	10/4/2021	
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS	downgradient									
Appendix III															
Boron	ug/L	NC	NA	619	NA	967	894	860	1,600	1,390	1,580	1,600	1,420	1,530	
Calcium	mg/L	NC	NA	302	NA	53.7	67.8	72	130	170	126	122	148	73.1	
Chloride	mg/L	250*	NA	2,440	NA	79.7	83.5	80	410	130	106	102	148	102	
Fluoride	ug/L	4,000	NA	1,000	NA	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	1,300	< 1,000	< 1,000	< 1,000	
Sulfate	mg/L	250*	NA	407	NA	263	77.2	45	150	367	142	139	216	58.3	
Total Dissolved Solids	mg/L	500*	NA	4,600	NA	660	536	560	1,300	1,100	791	776	926	599	
pH, Field	SU	6.5 - 8.5*	NA	6.5 - 7.3	NA	8.0	7.3	7.5	7.3	7.1	7.1	--	7.4	7.1	
Appendix IV															
Antimony	ug/L	6	NA	1	6	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1	< 1	< 1	
Arsenic	ug/L	10	NA	21	21	67.0	31.7	9.0	6.5	3	8	8	2	2	
Barium	ug/L	2,000	NA	1,300	2,000	84.5	71.6	71	140	196	133	131	211	102	
Beryllium	ug/L	4	NA	1	4	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1	< 1	< 1	
Cadmium	ug/L	5	NA	0.2	5	< 0.20	< 0.20	< 0.20	< 0.20	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	
Chromium	ug/L	100	NA	3	100	< 1.0	1.4	1.3	< 1.0	< 1	1	1	< 1	1	
Cobalt	ug/L	NC	6	15	15	< 15.0	< 6.0	< 6.0	< 6.0	< 6	< 6	< 6	< 6	< 6	
Fluoride	ug/L	4,000	NA	1,000	4,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	1,300	< 1,000	< 1,000	< 1,000	
Lead	ug/L	NC	15	1	15	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1	< 1	< 1	
Lithium	ug/L	NC	40	180	180	35	32	26	35	48	35	36	36	29	
Mercury	ug/L	2	NA	0.2	2	< 0.20	< 0.20	< 0.20	< 0.20	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	
Molybdenum	ug/L	NC	100	6	100	35.4	< 5.0	< 5.0	< 5.0	< 5	< 5	< 5	< 5	< 5	
Radium-226	pCi/L	NC	NA	NA	NA	< 0.698	< 0.850	< 0.376	0.334	0.673	< 0.430	< 0.577	0.582	1.47	
Radium-228	pCi/L	NC	NA	NA	NA	< 0.744	0.730	0.684	0.654	< 0.763	0.642	< 0.460	< 0.537	0.827	
Radium-226/228	pCi/L	5	NA	3.32	5	< 1.44	< 1.39	0.846	0.987	0.899	1.06	< 0.577	0.811	2.29	
Selenium	ug/L	50	NA	2	50	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	1	< 1	3	
Thallium	ug/L	2	NA	2	2	< 2.0	< 2.0	< 2.0	< 2.0	< 2	< 2	< 2	< 2	< 2	

Notes:

ug/L - micrograms per liter.

mg/L - milligrams per liter.

SU - standard units; pH is a field parameter.

pCi/L - picocuries per liter.

NA - not applicable.

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) Outlier; single detection above reporting limit.

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

		Sample Location:				DEK-MW-15005												
		Sample Date:				5/24/2018	11/6/2018	4/11/2019	4/11/2019	10/15/2019	10/15/2019	5/13/2020	5/13/2020	10/7/2020	5/3/2021	5/3/2021	10/4/2021	
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS	downgradient												
Appendix III																		
Boron	ug/L	NC	NA	619	NA	806	947	910	Field Dup	910	700	650	863	858	847	926	948	991
Calcium	mg/L	NC	NA	302	NA	33.4	32.9	31	31	60	59	71.0	72.1	155.0	95.6	97.6	102	
Chloride	mg/L	250*	NA	2,440	NA	72.6	69.1	60	60	64	64	48.0	47.5	52.7	65.2	65.1	82.3	
Fluoride	ug/L	4,000	NA	1,000	NA	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	
Sulfate	mg/L	250*	NA	407	NA	182	160	140	140	5.2	5.0	18.9	18.9	102	50.8	50.2	57.2	
Total Dissolved Solids	mg/L	500*	NA	4,600	NA	524	474	470	470	390	400	419	425	687	534	561	546	
pH, Field	SU	6.5 - 8.5*	NA	6.5 - 7.3	NA	7.8	7.9	7.7	--	7.6	--	8.1	--	7.7	7.6	--	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	< 1	< 1	
Arsenic	ug/L	10	NA	21	21	31.7	35.0	24	24	120	120	34	34	42	45	44	68	
Barium	ug/L	2,000	NA	1,300	2,000	58.5	56.7	46	45	110	100	127	127	248	173	170	192	
Beryllium	ug/L	4	NA	1	4	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1	< 1	< 1	< 1	
Cadmium	ug/L	5	NA	0.2	5	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.2	< 0.2	< 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	< 1	< 1	< 1	< 1	< 1	
Cobalt	ug/L	NC	6	15	15	< 15.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6	< 6	< 6	< 6	< 6	< 6	
Fluoride	ug/L	4,000	NA	1,000	4,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 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	< 1	< 1	
Lithium	ug/L	NC	40	180	180	19	17	15	14	16	15	20	20	45	38	39	41	
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	< 0.2	< 0.2	
Molybdenum	ug/L	NC	100	6	100	41.9	45.3	39	38	< 5.0	< 5.0	< 5	< 5	< 5	8	8	7	
Radium-226	pCi/L	NC	NA	NA	NA	< 0.740	< 0.865	< 0.379	< 0.406	0.165	0.185	< 0.469	< 0.335	0.621	0.291	< 0.187	1.12	
Radium-228	pCi/L	NC	NA	NA	NA	0.857	< 0.598	< 0.754	< 0.586	< 0.456	0.497	1.14	< 0.554	< 0.502	< 0.459	0.479	0.940	
Radium-226/228	pCi/L	5	NA	3.32	5	< 1.53	< 1.46	< 0.754	< 0.586	0.524	0.682	1.34	0.662	0.875	0.722	0.65	2.06	
Selenium	ug/L	50	NA	2	50	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1	1	1	2	
Thallium	ug/L	2	NA	2	2	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2	< 2	< 2	< 2	< 2	< 2	

Notes:

- ug/L - micrograms per liter.
- mg/L - milligrams per liter.
- SU - standard units; pH is a field parameter.
- pCi/L - picocuries per liter.
- NA - not applicable.
- 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) Outlier; single detection above reporting limit.

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

		Sample Location:				DEK-MW-15006									
		Sample Date:				5/24/2018	11/5/2018	11/5/2018	4/11/2019	10/14/2019	5/13/2020	10/7/2020	5/3/2021	10/4/2021	10/4/2021
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS	downgradient									
Appendix III								Field Dup						Field Dup	
Boron	ug/L	NC	NA	619	NA	1,200	1,340	1,270	1,700	1,200	1,090	1,220	938	1,050	1080
Calcium	mg/L	NC	NA	302	NA	21.9	29.4	29.6	35	34	70.4	106	115	117	117
Chloride	mg/L	250*	NA	2,440	NA	85.8	87.9	88.3	75	45	71.5	102	63.5	78.9	74.7
Fluoride	ug/L	4,000	NA	1,000	NA	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	1,060	< 1,000	< 1000	< 1000
Sulfate	mg/L	250*	NA	407	NA	401	341	344	320	74	316	296	324	209	196
Total Dissolved Solids	mg/L	500*	NA	4,600	NA	944	792	784	780	450	833	1,010	790	712	708
pH, Field	SU	6.5 - 8.5*	NA	6.5 - 7.3	NA	8.2	7.9	--	7.8	7.8	8.1	7.7	7.5	7.3	--
Appendix IV															
Antimony	ug/L	6	NA	1	6	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	3	< 1	< 1	< 1	< 1
Arsenic	ug/L	10	NA	21	21	25.7	20.9	19.6	21	27	21	27	24	23	24
Barium	ug/L	2,000	NA	1,300	2,000	22.8	38.5	38.3	43	51	86	141	139	125	126
Beryllium	ug/L	4	NA	1	4	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1	< 1	< 1
Cadmium	ug/L	5	NA	0.2	5	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium	ug/L	100	NA	3	100	< 1.0	< 1.0	< 1.0	< 1.0	1.1	2	6	< 1	< 1	< 1
Cobalt	ug/L	NC	6	15	15	< 15.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6	< 6	< 6	< 6	< 6
Fluoride	ug/L	4,000	NA	1,000	4,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	1,060	< 1,000	< 1000	< 1000
Lead	ug/L	NC	15	1	15	320 ⁽¹⁾	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1	< 1	< 1
Lithium	ug/L	NC	40	180	180	< 10	< 10	< 10	< 10	11	15	22	21	19	19
Mercury	ug/L	2	NA	0.2	2	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Molybdenum	ug/L	NC	100	6	100	48.7	50.3	48.0	59	11	18	11	9	7	7
Radium-226	pCi/L	NC	NA	NA	NA	< 0.738	< 0.885	< 1.06	< 0.459	< 0.159	< 0.370	0.629	0.353	0.797	0.832
Radium-228	pCi/L	NC	NA	NA	NA	< 1.12	< 0.649	< 0.897	< 0.677	< 0.581	0.78	0.492	0.804	0.704	0.518
Radium-226/228	pCi/L	5	NA	3.32	5	< 1.86	< 1.53	< 1.96	< 0.677	< 0.581	1.01	1.12	1.16	1.50	1.35
Selenium	ug/L	50	NA	2	50	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1	2	2
Thallium	ug/L	2	NA	2	2	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2	< 2	< 2	< 2	< 2

Notes:

ug/L - micrograms per liter.

mg/L - milligrams per liter.

SU - standard units; pH is a field parameter.

pCi/L - picocuries per liter.

NA - not applicable.

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) Outlier; single detection above reporting limit.

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

Sample Location:						DEK-MW-18001							
Sample Date:						5/23/2018	11/6/2018	4/10/2019	10/15/2019	5/14/2020	10/6/2020	5/3/2021	10/7/2021
Constituent	Unit	EPA MCL	EPA RSL	UTL	GWPS	downgradient							
Appendix III													
Boron	ug/L	NC	NA	619	NA	1,600	1,020	970	2,200	1,670	1,740	1,180	1,370
Calcium	mg/L	NC	NA	302	NA	64.9	51.1	48	84	72.1	71.7	65.2	71
Chloride	mg/L	250*	NA	2,440	NA	69.1	76.6	69	81	64.7	60.7	51.6	55.2
Fluoride	ug/L	4,000	NA	1,000	NA	< 1,000	1,300	1,200	1,000	1,090	1,240	< 1,000	< 1000
Sulfate	mg/L	250*	NA	407	NA	30.6	< 2.0	< 2.0	31	51.1	91.9	121	118
Total Dissolved Solids	mg/L	500*	NA	4,600	NA	434	340	360	500	484	476	486	494
pH, Field	SU	6.5 - 8.5*	NA	6.5 - 7.3	NA	7.8	7.5	7.2	7.3	7.7	7.6	7.3	7.4
Appendix IV													
Antimony	ug/L	6	NA	1	6	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1	< 1
Arsenic	ug/L	10	NA	21	21	225	116	68	63	79	85	92	85
Barium	ug/L	2,000	NA	1,300	2,000	101	79.5	75	160	130	136	135	135
Beryllium	ug/L	4	NA	1	4	< 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	< 0.2	< 0.2	< 0.2	< 0.2
Chromium	ug/L	100	NA	3	100	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1	< 1
Cobalt	ug/L	NC	6	15	15	< 15.0	< 6.0	< 6.0	< 6.0	< 6	< 6	< 6	< 6
Fluoride	ug/L	4,000	NA	1,000	4,000	< 1,000	1,300	1,200	1,000	1,090	1,240	< 1,000	< 1000
Lead	ug/L	NC	15	1	15	< 1.0	< 1.0	< 1.0	< 1.0	< 1	< 1	< 1	< 1
Lithium	ug/L	NC	40	180	180	23	24	24	36	27	26	25	24
Mercury	ug/L	2	NA	0.2	2	< 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	< 5	< 5	< 5
Radium-226	pCi/L	NC	NA	NA	NA	0.906	< 0.813	0.173	0.206	< 0.608	< 0.473	0.189	0.873
Radium-228	pCi/L	NC	NA	NA	NA	< 0.733	0.811	0.694	0.746	< 0.676	0.463	0.639	0.979
Radium-226/228	pCi/L	5	NA	3.32	5	1.63	1.56	0.867	0.952	< 0.676	0.591	0.828	1.85
Selenium	ug/L	50	NA	2	50	< 1.0	< 1.0	< 1.0	< 1.0	< 1	1	< 1	2
Thallium	ug/L	2	NA	2	2	< 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.

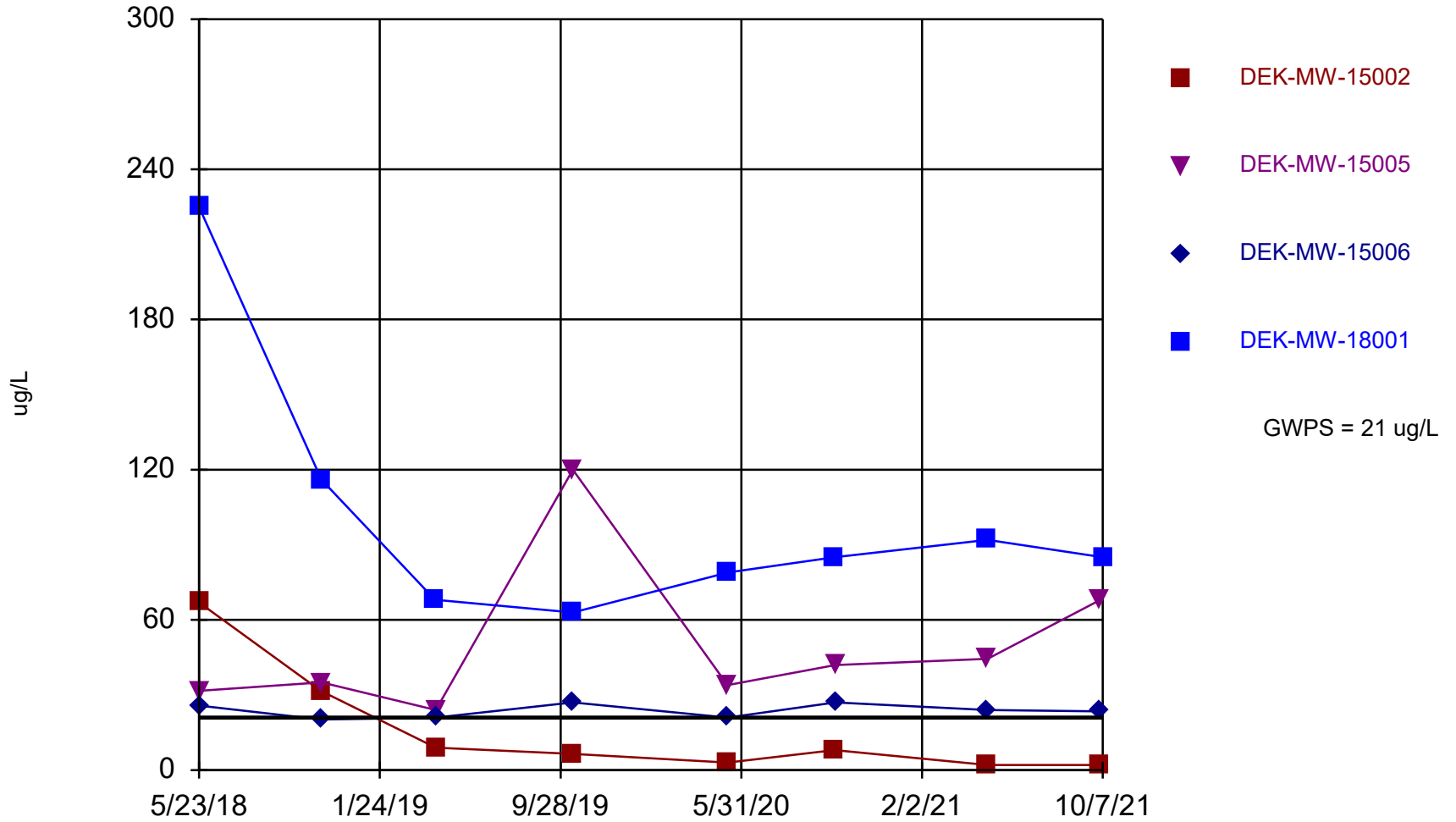
All metals were analyzed as total unless otherwise specified.

(1) Outlier; single detection above reporting limit.

Attachment 1

Sanitas™ Output Files

Arsenic Comparison to GWPS



Time Series Analysis Run 12/7/2021 1:22 PM
Client: Consumers Energy Data: DEK_HMPCCR_Sanitas_21Q4

Summary Report

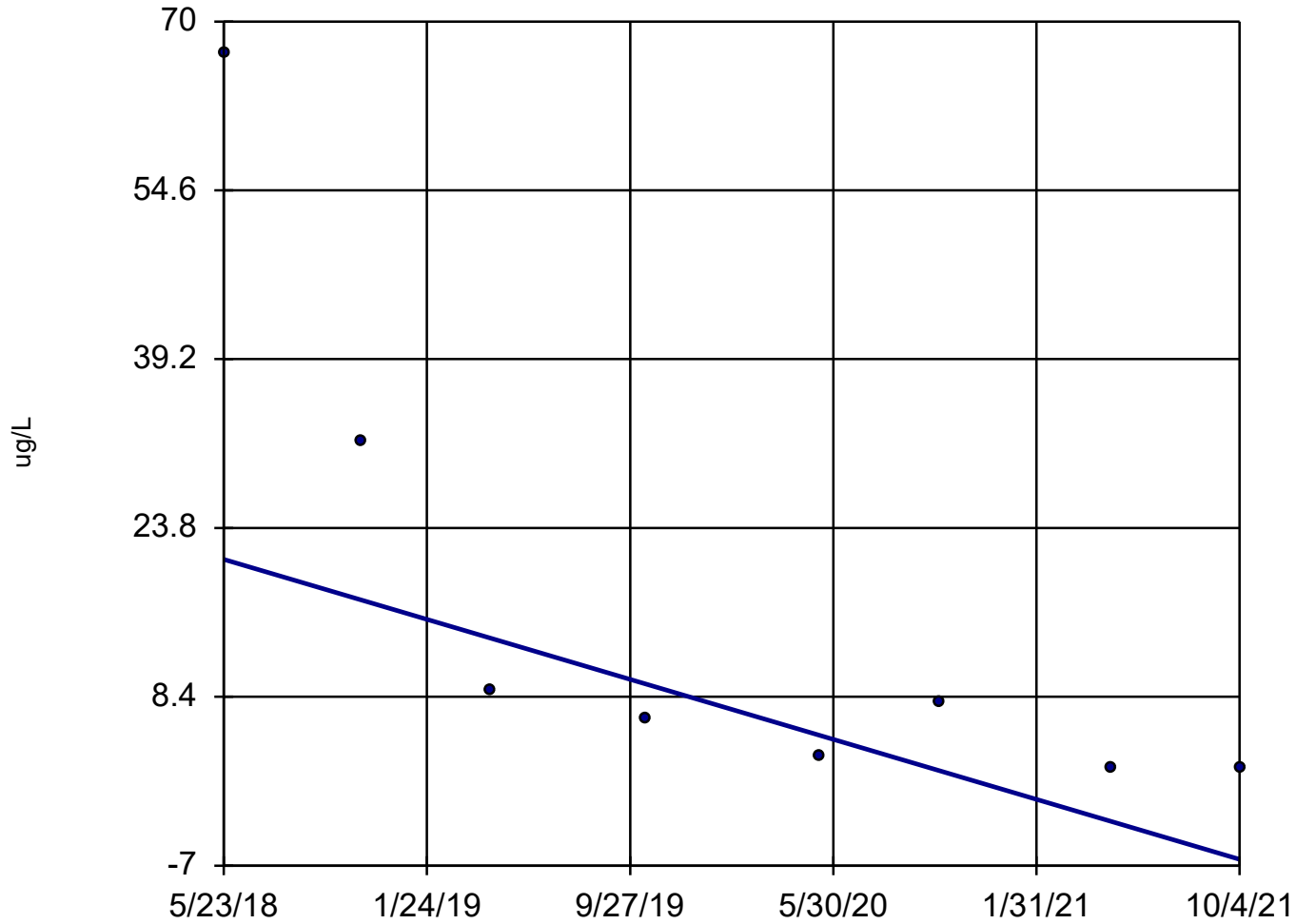
Constituent: Arsenic, Total Analysis Run 12/7/2021 1:25 PM
 Client: Consumers Energy Data: DEK_HMPCCR_Sanitas_21Q4

For observations made between 5/23/2018 and 10/7/2021, a summary of the selected data set:

Observations = 32
 ND/Trace = 0
 Wells = 4
 Minimum Value = 2
 Maximum Value = 225
 Mean Value = 47.84
 Median Value = 31.7
 Standard Deviation = 45.99
 Coefficient of Variation = 0.9613
 Skewness = 1.981

<u>Well</u>	<u>#Obs.</u>	<u>ND/Trace</u>	<u>Min</u>	<u>Max</u>	<u>Mean</u>	<u>Median</u>	<u>Std.Dev.</u>	<u>CV</u>	<u>Skewness</u>
DEK-MW-15002	8	0	2	67	16.15	7.25	22.71	1.406	1.635
DEK-MW-15005	8	0	24	120	49.9	38.5	31.19	0.6251	1.606
DEK-MW-15006	8	0	20.25	27	23.68	23.75	2.736	0.1155	0.01798
DEK-MW-18001	8	0	63	225	101.6	85	52.38	0.5155	1.874

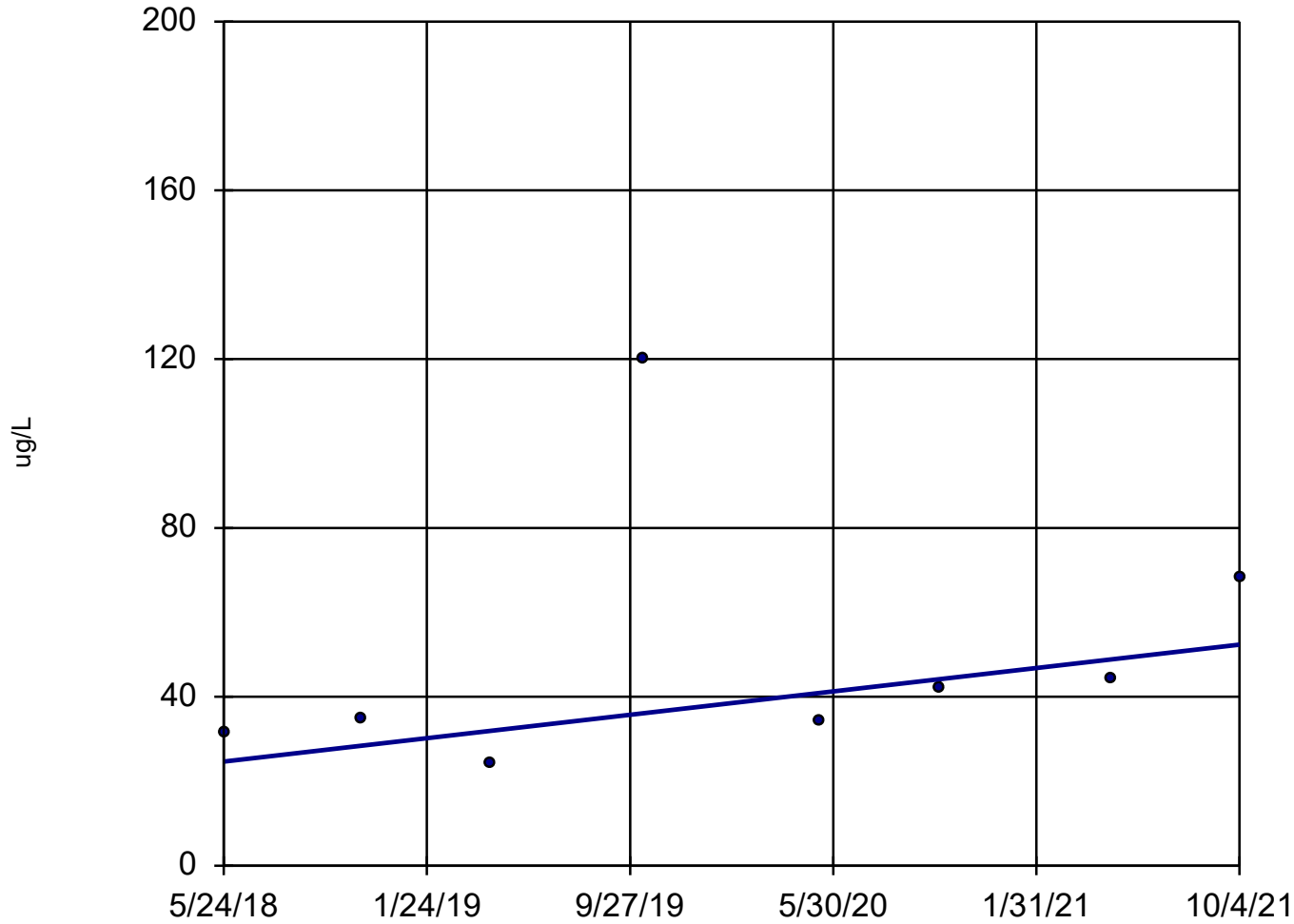
Arsenic, Total DEK-MW-15002



n = 8
Slope = -8.121
units per year.
Mann-Kendall
statistic = -23
critical = -20
Decreasing trend
significant at 98%
confidence level
($\alpha = 0.01$ per
tail).

Sen's Slope Estimator Analysis Run 12/7/2021 1:27 PM
Client: Consumers Energy Data: DEK_HMPCCR_Sanitas_21Q4

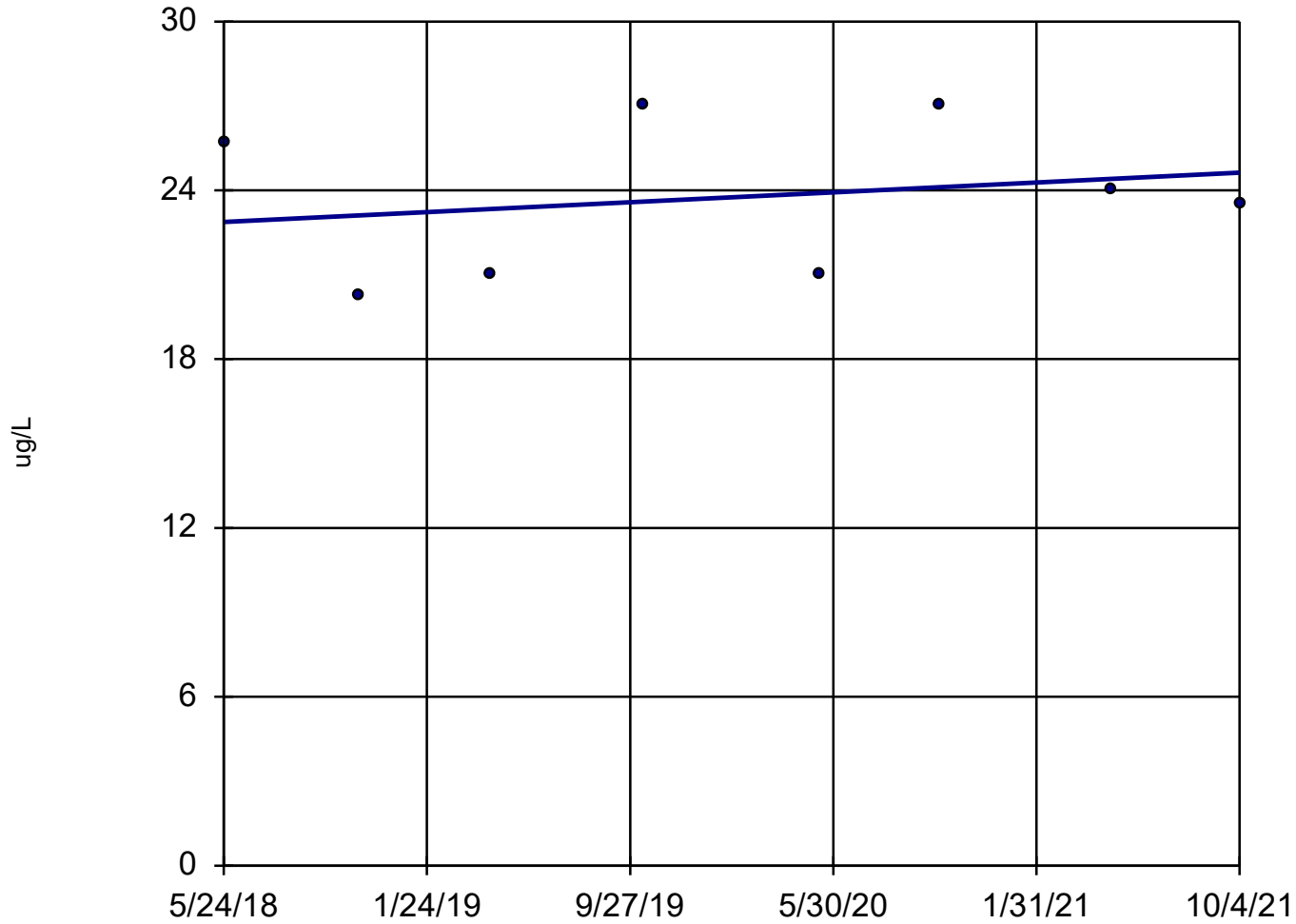
Arsenic, Total DEK-MW-15005



n = 8
Slope = 8.213
units per year.
Mann-Kendall
statistic = 14
critical = 20
Trend not sig-
nificant at 98%
confidence level
($\alpha = 0.01$ per
tail).

Sen's Slope Estimator Analysis Run 12/7/2021 1:27 PM
Client: Consumers Energy Data: DEK_HMPCCR_Sanitas_21Q4

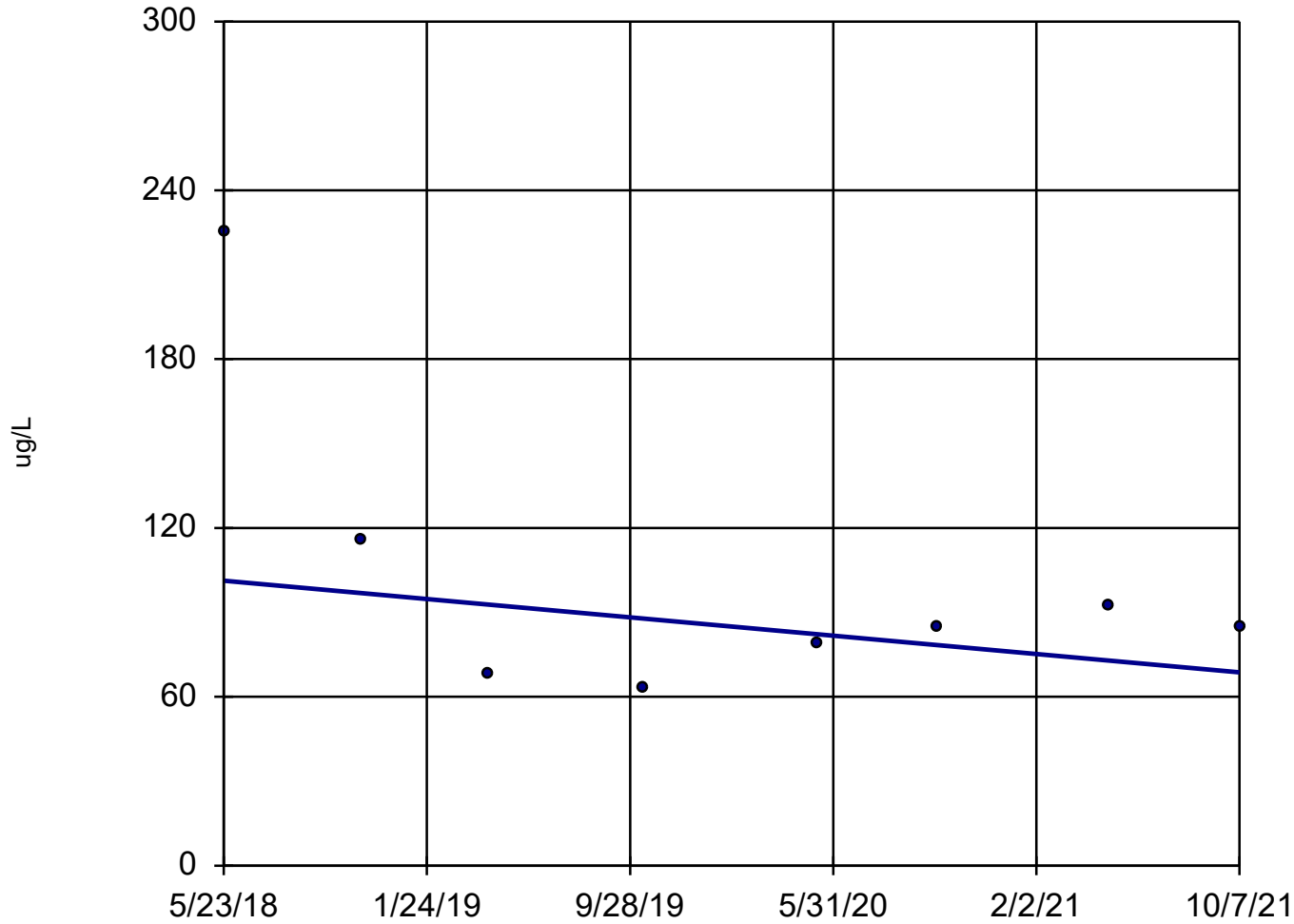
Arsenic, Total DEK-MW-15006



n = 8
Slope = 0.5203
units per year.
Mann-Kendall
statistic = 4
critical = 20
Trend not sig-
nificant at 98%
confidence level
($\alpha = 0.01$ per
tail).

Sen's Slope Estimator Analysis Run 12/7/2021 1:27 PM
Client: Consumers Energy Data: DEK_HMPCCR_Sanitas_21Q4

Arsenic, Total DEK-MW-18001

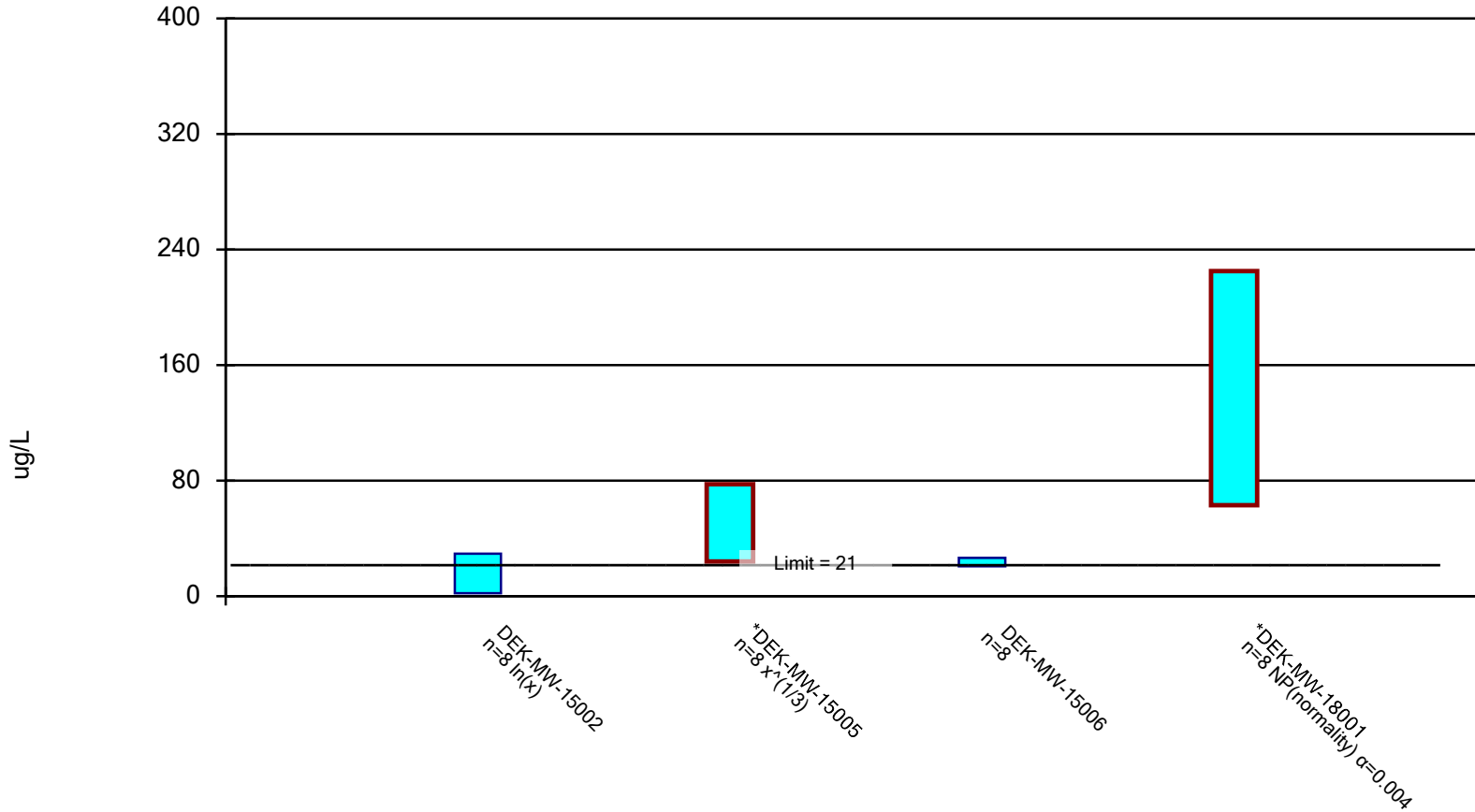


n = 8
Slope = -9.672
units per year.
Mann-Kendall
statistic = -3
critical = -20
Trend not sig-
nificant at 98%
confidence level
($\alpha = 0.01$ per
tail).

Sen's Slope Estimator Analysis Run 12/7/2021 1:27 PM
Client: Consumers Energy Data: DEK_HMPCCR_Sanitas_21Q4

Parametric and Non-Parametric (NP) Confidence Interval

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



Constituent: Arsenic, Total Analysis Run 12/7/2021 1:36 PM
Client: Consumers Energy Data: DEK_HMPCCR_Sanitas_21Q4

Confidence Interval

Constituent: Arsenic, Total (ug/L) Analysis Run 12/7/2021 1:37 PM

Client: Consumers Energy Data: DEK_HMPCCR_Sanitas_21Q4

	DEK-MW-15002	DEK-MW-15005	DEK-MW-15006	DEK-MW-18001
5/23/2018	67			225
5/24/2018		31.7	25.7	
11/5/2018	31.7		20.25 (D)	
11/6/2018		35		116
4/10/2019				68
4/11/2019	9	24 (D)	21	
10/15/2019	6.5	120 (D)	27	63
5/13/2020	3	34 (D)	21	
5/14/2020				79
10/6/2020	8 (D)			85
10/7/2020		42	27	
5/3/2021	2	44.5 (D)	24	92
10/4/2021	2	68	23.5 (D)	
10/7/2021				85
Mean	16.15	49.9	23.68	101.6
Std. Dev.	22.71	31.19	2.736	52.38
Upper Lim.	29.4	77.5	26.58	225
Lower Lim.	1.999	24.01	20.78	63

Appendix C

Groundwater Flow Evaluation

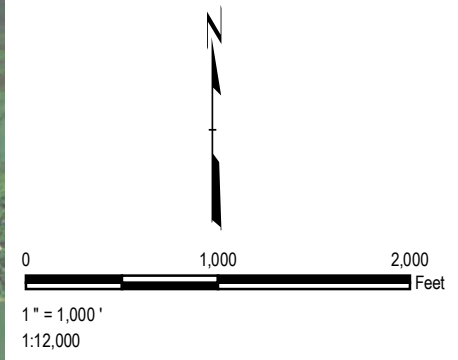


LEGEND

- BACKGROUND MONITORING WELL
- BEDROCK MONITORING WELL
- DEK BOTTOM ASH POND MONITORING WELL
- JCW BOTTOM ASH POND MONITORING WELL
- JCW LANDFILL MONITORING WELL
- SURFACE WATER GAUGING STATION
- SLURRY WALL (APPROXIMATE)
- GROUNDWATER ELEVATION CONTOUR (2' INTERVAL, DASHED WHERE INFERRED)
- GROUNDWATER ELEVATION (FEET, MSL)

NOTES

1. BASE MAP IMAGERY FROM USDA - NATIONAL AGRICULTURE IMAGERY PROGRAM, 7/10/2016.
2. WELL LOCATIONS SURVEYED BY ROWE PROFESSIONAL SERVICES COMPANY ON 11/4/2015.
3. NOAA/NATIONAL OCEANIC SERVICE GREAT LAKES GAUGING STATION, ESSEXVILLE, MI (ID: 9075035).



PROJECT:	
CONSUMERS ENERGY COMPANY DE KARN AND JC WEADOCK POWER PLANTS ESSEXVILLE, MICHIGAN	
TITLE:	
SHALLOW GROUNDWATER CONTOUR MAP DECEMBER 2015	
DRAWN BY: J. PAPEZ	PROJ NO.: 269767-002/3
CHECKED BY: D. LITZ	FIGURE 1
APPROVED BY: G. CROCKFORD	
DATE: OCTOBER 2017	
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FILE NO.: 269767-002_3-001.mxd	



LEGEND

- BACKGROUND MONITORING WELL
- BEDROCK MONITORING WELL
- DEK BOTTOM ASH POND MONITORING WELL
- JCW BOTTOM ASH POND MONITORING WELL
- JCW LANDFILL MONITORING WELL
- SURFACE WATER GAUGING STATION
- SLURRY WALL (APPROXIMATE)
- GROUNDWATER ELEVATION CONTOUR (2' INTERVAL, DASHED WHERE INFERRED)
- GROUNDWATER ELEVATION (FEET, MSL)

- NOTES**
1. BASE MAP IMAGERY FROM USDA – NATIONAL AGRICULTURE IMAGERY PROGRAM, 7/10/2016.
 2. WELL LOCATIONS SURVEYED BY ROWE PROFESSIONAL SERVICES COMPANY ON 11/4/2015.
 3. NOAA/NATIONAL OCEANIC SERVICE GREAT LAKES GAUGING STATION, ESSEXVILLE, MI (ID: 9075035).

N

0 1,000 2,000
Feet

1" = 1,000'
1:12,000

PROJECT:	
CONSUMERS ENERGY COMPANY DE KARN AND JC WEADOCK POWER PLANTS ESSEXVILLE, MICHIGAN	
TITLE:	
SHALLOW GROUNDWATER CONTOUR MAP MARCH 2016	
DRAWN BY: J. PAPEZ	PROJ NO.: 269767-002/3
CHECKED BY: D. LITZ	FIGURE 2
APPROVED BY: G. CROCKFORD	
DATE: OCTOBER 2017	
1540 Eisenhower Place Ann Arbor, MI 48108-3284 Phone: 734.971.7080 www.trcsolutions.com	
FILE NO.: 269767-002_3-002.mxd	

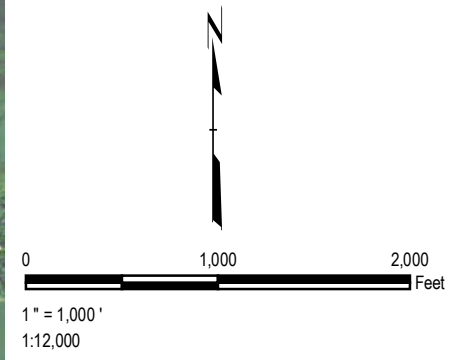


LEGEND

- BACKGROUND MONITORING WELL
- BEDROCK MONITORING WELL
- DEK BOTTOM ASH POND MONITORING WELL
- JCW BOTTOM ASH POND MONITORING WELL
- JCW LANDFILL MONITORING WELL
- SURFACE WATER GAUGING STATION
- SLURRY WALL (APPROXIMATE)
- GROUNDWATER ELEVATION CONTOUR (2' INTERVAL, DASHED WHERE INFERRED)
- GROUNDWATER ELEVATION (FEET, MSL)

NOTES

1. BASE MAP IMAGERY FROM USDA - NATIONAL AGRICULTURE IMAGERY PROGRAM, 7/10/2016.
2. WELL LOCATIONS SURVEYED BY ROWE PROFESSIONAL SERVICES COMPANY ON 11/4/2015.
3. NOAA/NATIONAL OCEANIC SERVICE GREAT LAKES GAUGING STATION, ESSEXVILLE, MI (ID: 9075035).



PROJECT:		CONSUMERS ENERGY COMPANY DE KARN AND JC WEADOCK POWER PLANTS ESSEXVILLE, MICHIGAN	
TITLE:		SHALLOW GROUNDWATER CONTOUR MAP AUGUST 2016	
DRAWN BY:	J. PAPEZ	PROJ NO.:	269767-002/3
CHECKED BY:	D. LITZ	FIGURE 4	
APPROVED BY:	G. CROCKFORD		
DATE:	OCTOBER 2017		
		1540 Eisenhower Place Ann Arbor, MI 48108-3284 Phone: 734.971.7080 www.trcsolutions.com	
FILE NO.:	269767-002_3-004.mxd		

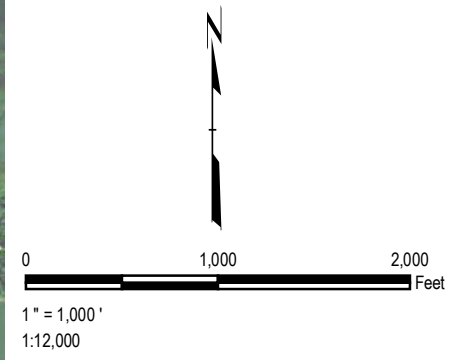


LEGEND

- BACKGROUND MONITORING WELL
- BEDROCK MONITORING WELL
- DEK BOTTOM ASH POND MONITORING WELL
- JCW BOTTOM ASH POND MONITORING WELL
- JCW LANDFILL MONITORING WELL
- SURFACE WATER GAUGING STATION
- SLURRY WALL (APPROXIMATE)
- GROUNDWATER ELEVATION CONTOUR (2' INTERVAL, DASHED WHERE INFERRED)
- (580.85) GROUNDWATER ELEVATION (FEET, MSL)

NOTES

1. BASE MAP IMAGERY FROM USDA - NATIONAL AGRICULTURE IMAGERY PROGRAM, 7/10/2016.
2. WELL LOCATIONS SURVEYED BY ROWE PROFESSIONAL SERVICES COMPANY ON 11/4/2015.
3. NOAA/NATIONAL OCEANIC SERVICE GREAT LAKES GAUGING STATION, ESSEXVILLE, MI (ID: 9075035).



PROJECT:		CONSUMERS ENERGY COMPANY DE KARN AND JC WEADOCK POWER PLANTS ESSEXVILLE, MICHIGAN	
TITLE:		SHALLOW GROUNDWATER CONTOUR MAP NOVEMBER 2016	
DRAWN BY:	J. PAPEZ	PROJ NO.:	269767-002/3
CHECKED BY:	D. LITZ	FIGURE 5	
APPROVED BY:	G. CROCKFORD		
DATE:	OCTOBER 2017		
		1540 Eisenhower Place Ann Arbor, MI 48108-3284 Phone: 734.971.7080 www.trcsolutions.com	
FILE NO.:	269767-002_3-005.mxd		



LEGEND

- BACKGROUND MONITORING WELL
- BEDROCK MONITORING WELL
- DEK BOTTOM ASH POND MONITORING WELL
- JCW BOTTOM ASH POND MONITORING WELL
- JCW LANDFILL MONITORING WELL
- SURFACE WATER GAUGING STATION
- SLURRY WALL (APPROXIMATE)
- GROUNDWATER ELEVATION CONTOUR (2' INTERVAL, DASHED WHERE INFERRED)
- GROUNDWATER ELEVATION (FEET, MSL)

- NOTES**
1. BASE MAP IMAGERY FROM USDA - NATIONAL AGRICULTURE IMAGERY PROGRAM, 7/10/2016.
 2. WELL LOCATIONS SURVEYED BY ROWE PROFESSIONAL SERVICES COMPANY ON 11/4/2015.
 3. NOAA/NATIONAL OCEANIC SERVICE GREAT LAKES GAUGING STATION, ESSEXVILLE, MI (ID: 9075035).

0 1,000 2,000 Feet

1" = 1,000'

1:12,000

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

TITLE: SHALLOW GROUNDWATER CONTOUR MAP
FEBRUARY 2017

DRAWN BY: J. PAPEZ PROJ NO: 269767-002/3

CHECKED BY: D. LITZ

APPROVED BY: G. CROCKFORD

DATE: OCTOBER 2017

FIGURE 6

TRC

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FILE NO: 269767-002_3-006.mxd



LEGEND

- BACKGROUND MONITORING WELL
- BEDROCK MONITORING WELL
- DEK BOTTOM ASH POND MONITORING WELL
- JCW BOTTOM ASH POND MONITORING WELL
- JCW LANDFILL MONITORING WELL
- SURFACE WATER GAUGING STATION
- SLURRY WALL (APPROXIMATE)
- GROUNDWATER ELEVATION CONTOUR (2' INTERVAL, DASHED WHERE INFERRED)
- GROUNDWATER ELEVATION (FEET, MSL)

- NOTES**
1. BASE MAP IMAGERY FROM USDA - NATIONAL AGRICULTURE IMAGERY PROGRAM, 7/10/2016.
 2. WELL LOCATIONS SURVEYED BY ROWE PROFESSIONAL SERVICES COMPANY ON 11/4/2015.
 3. NOAA/NATIONAL OCEANIC SERVICE GREAT LAKES GAUGING STATION, ESSEXVILLE, MI (ID: 9075035).

0 1,000 2,000 Feet

1" = 1,000'

1:12,000

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

TITLE: **SHALLOW GROUNDWATER CONTOUR MAP
MAY 2017**

DRAWN BY: J. PAPEZ	PROJ NO: 269767-002/3
CHECKED BY: D. LITZ	FIGURE 7
APPROVED BY: G. CROCKFORD	
DATE: OCTOBER 2017	

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FILE NO: 269767-002_3-009.mxd



LEGEND

- BACKGROUND MONITORING WELL
- BEDROCK MONITORING WELL
- DEK BOTTOM ASH POND MONITORING WELL
- JCW BOTTOM ASH POND MONITORING WELL
- JCW LANDFILL MONITORING WELL
- SURFACE WATER GAUGING STATION
- SLURRY WALL (APPROXIMATE)
- GROUNDWATER ELEVATION CONTOUR (2' INTERVAL, DASHED WHERE INFERRED)
- GROUNDWATER ELEVATION (FEET, MSL)

- NOTES**
1. BASE MAP IMAGERY FROM USDA – NATIONAL AGRICULTURE IMAGERY PROGRAM, 7/10/2016.
 2. WELL LOCATIONS SURVEYED BY ROWE PROFESSIONAL SERVICES COMPANY ON 11/4/2015.
 3. NOAA/NATIONAL OCEANIC SERVICE GREAT LAKES GAUGING STATION, ESSEXVILLE, MI (ID: 9075035).

0 1,000 2,000
Feet

1" = 1,000'
1:12,000

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

TITLE: **SHALLOW GROUNDWATER CONTOUR MAP
AUGUST 2017**

DRAWN BY: J. PAPEZ	PROJ NO.: 269767-002/3
CHECKED BY: D. LITZ	FIGURE 8
APPROVED BY: G. CROCKFORD	
DATE: OCTOBER 2017	

TRC

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FILE NO.: 269767-002_3-019.mxd

TRC - GIS
 Coordinate System: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl (Foot)
 Map Rotation
 Plot Date: 1/3/2018, 16:55:59 PM by SMAJOR -- LAYOUT: ANSIB(11"x17")
 Path: E:\ConsumersEnergy\GIS\2017_269767\269767_002_3_021.mxd



LEGEND

- BACKGROUND MONITORING WELL
- DEK BOTTOM ASH POND MONITORING WELL
- JCW BOTTOM ASH POND MONITORING WELL
- JCW LANDFILL MONITORING WELL
- SURFACE WATER GAUGING STATION
- MONITORING WELL (STATIC WATER LEVEL ONLY)
- SLURRY WALL (APPROXIMATE)
- GROUNDWATER ELEVATION CONTOUR (2' INTERVAL, DASHED WHERE INFERRED)
- GROUNDWATER ELEVATION (FEET, MSL)

- ### NOTES
1. BASE MAP IMAGERY FROM USDA – NATIONAL AGRICULTURE IMAGERY PROGRAM, 7/10/2016.
 2. WELL LOCATIONS SURVEYED BY ROWE PROFESSIONAL SERVICES COMPANY ON 11/4/2015.
 3. NOAA/NATIONAL OCEANIC SERVICE GREAT LAKES GAUGING STATION, ESSEXVILLE, MI (ID: 9075035).

1" = 1,000'
1:12,000

PROJECT:	
CONSUMERS ENERGY COMPANY DE KARN AND JC WEADOCK POWER PLANTS ESSEXVILLE, MICHIGAN	
TITLE:	
SHALLOW GROUNDWATER CONTOUR MAP SEPTEMBER 2017	
DRAWN BY: S. MAJOR	PROJ NO.: 269767-002
CHECKED BY: D. LITZ	FIGURE 3
APPROVED BY: G. CROCKFORD	
DATE: JANUARY 2018	
1540 Eisenhower Place Ann Arbor, MI 48108-3284 Phone: 734.971.7080 www.trcsolutions.com	
FILE NO.: 269767-002_3-021.mxd	

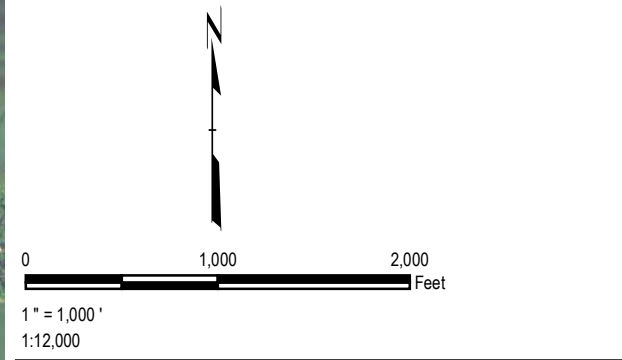


LEGEND

- BACKGROUND MONITORING WELL
- DEK BOTTOM ASH POND & LINED IMPOUNDMENT MONITORING WELL
- DEK BOTTOM ASH POND MONITORING WELL
- DEK LINED IMPOUNDMENT MONITORING WELL
- DECOMMISSIONED MONITORING WELL
- EXTRACTION WELL
- JCW BOTTOM ASH POND MONITORING WELL
- JCW LANDFILL MONITORING WELL
- MONITORING WELL (STATIC WATER LEVEL ONLY)
- PIEZOMETER
- SLURRY WALL (APPROXIMATE)
- GROUNDWATER ELEVATION CONTOUR (2' INTERVAL, DASHED WHERE INFERRED)
- GROUNDWATER ELEVATION (FEET, MSL)

NOTES

1. BASE MAP IMAGERY FROM USDA – NATIONAL AGRICULTURE IMAGERY PROGRAM, 7/10/2016.
2. WELL LOCATIONS SURVEYED BY ROWE PROFESSIONAL SERVICES COMPANY ON 11/4/2015.
3. NOAA/NATIONAL OCEANIC SERVICE GREAT LAKES GAUGING STATION, ESSEXVILLE, MI (ID: 9075035).
4. MONITORING WELL DEK- MW-18001 INSTALLED IN MAY 2018. SURVEY DATA NOT YET AVAILABLE.



PROJECT:		CONSUMERS ENERGY COMPANY DE KARN AND JC WEADOCK POWER PLANTS ESSEXVILLE, MICHIGAN	
TITLE:		SHALLOW GROUNDWATER CONTOUR MAP APRIL 2018	
DRAWN BY:	S. MAJOR	PROJ NO.:	290805-001
CHECKED BY:	C. SCIESZKA	FIGURE 2	
APPROVED BY:	D. LITZ		
DATE:	OCTOBER 2018		
FILE NO.:		290805-001-001x.mxd	



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Phone: 734.971.7080
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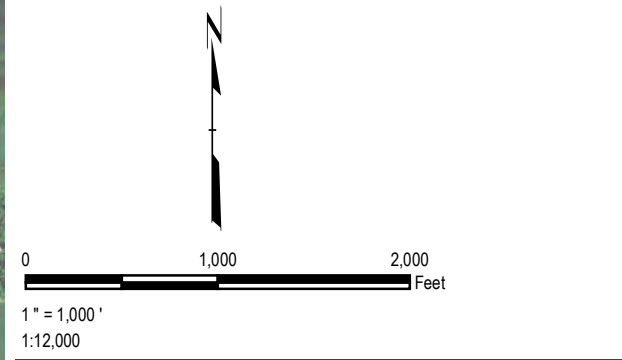


LEGEND

- BACKGROUND MONITORING WELL
- DEK BOTTOM ASH POND & LINED IMPOUNDMENT MONITORING WELL
- DEK BOTTOM ASH POND MONITORING WELL
- DEK LINED IMPOUNDMENT MONITORING WELL
- DECOMMISSIONED MONITORING WELL
- EXTRACTION WELL
- JCW BEDROCK MONITORING WELL
- JCW BOTTOM ASH POND MONITORING WELL
- JCW LANDFILL MONITORING WELL
- MONITORING WELL (STATIC WATER LEVEL ONLY)
- PIEZOMETER
- GROUNDWATER ELEVATION CONTOUR (2' INTERVAL, DASHED WHERE INFERRED)
- SLURRY WALL (APPROXIMATE)
- (580.85) GROUNDWATER ELEVATION (FEET, MSL)

NOTES

1. BASE MAP IMAGERY FROM USDA – NATIONAL AGRICULTURE IMAGERY PROGRAM, 7/10/2016.
2. WELL LOCATIONS SURVEYED BY ROWE PROFESSIONAL SERVICES COMPANY ON 11/4/2015.
3. NOAA/NATIONAL OCEANIC SERVICE GREAT LAKES GAUGING STATION, ESSEXVILLE, MI (ID: 9075035).
4. MONITORING WELL DEK- MW-18001 WAS INSTALLED IN MAY 2018. SURVEY DATA NOT YET AVAILABLE.



PROJECT:		CONSUMERS ENERGY COMPANY DE KARN AND JC WEADOCK POWER PLANTS ESSEXVILLE, MICHIGAN	
TITLE:		SHALLOW GROUNDWATER CONTOUR MAP MAY 2018	
DRAWN BY:	S. MAJOR	PROJ NO.:	290805-001
CHECKED BY:	C. SCIESZKA	FIGURE 3	
APPROVED BY:	D. LITZ		
DATE:	OCTOBER 2018		
FILE NO.:		290805-001-005.mxd	



LEGEND

- BACKGROUND MONITORING WELL
- DEK BOTTOM ASH POND & LINED IMPOUNDMENT MONITORING WELL
- DEK BOTTOM ASH POND MONITORING WELL
- DEK LINED IMPOUNDMENT MONITORING WELL
- JCW BOTTOM ASH POND MONITORING WELL
- JCW LANDFILL CCR WELL
- MONITORING WELL (STATIC WATER LEVEL ONLY)
- LEACHATE HEADWELL
- SURFACE WATER GAUGING STATION
- SLURRY WALL (APPROXIMATE)
- EXTENT OF GEOSYNTHETICS (KARN LINED IMPOUNDMENT)
- GROUNDWATER ELEVATION CONTOUR (2' INTERVAL, DASHED WHERE INFERRED)
- (580.50)** GROUNDWATER ELEVATION (FEET)
- (NM)** NOT MEASURED

NOTES

1. BASE MAP IMAGERY FROM USDA - NATIONAL AGRICULTURE IMAGERY PROGRAM, 7/10/2016.
2. WELL LOCATIONS SURVEYED BY ROWE PROFESSIONAL SERVICES COMPANY ON 11/4/2015.
3. NOAA/NATIONAL OCEANIC SERVICE GREAT LAKES GAUGING STATION, ESSEXVILLE, MI (ID: 9075035).
4. GROUNDWATER ELEVATION DATA RECORDED OCTOBER 22, 2018.
5. GROUNDWATER ELEVATIONS DISPLAYED IN FEET RELATIVE TO THE NORTH AMERICAN VERTICAL DATUM OF 1988.

0 1,000 2,000
Feet

1" = 1,000'
1:12,000

N

PROJECT:		CONSUMERS ENERGY COMPANY DE KARN AND JC WEADOCK POWER PLANTS ESSEXVILLE, MICHIGAN	
TITLE:		SHALLOW GROUNDWATER CONTOUR MAP NOVEMBER 2018	
DRAWN BY:	S. MAJOR	PROJ NO.:	322173-001
CHECKED BY:	J. KRENZ	FIGURE 2	
APPROVED BY:	D. LITZ		
DATE:	MARCH 2019		

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Ann Arbor, MI 48108-3284
Phone: 734.971.7080
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FILE NO.: 290805-001-022.mxd



LEGEND

- DEK BOTTOM ASH POND & LINED IMPOUNDMENT MONITORING WELL
- DEK BOTTOM ASH POND MONITORING WELL
- DEK LINED IMPOUNDMENT MONITORING WELL
- DECOMMISSIONED MONITORING WELL
- MONITORING WELL (STATIC ONLY)
- SURFACE WATER GAUGING STATION
- NATURE AND EXTENT WELL
- SLURRY WALL (APPROXIMATE)
- EXTENT OF GEOSYNTHETICS (KARN LINED IMPOUNDMENT)
- GROUNDWATER ELEVATION CONTOUR (2' INTERVAL, DASHED WHERE INFERRED)
- (580.50)** GROUNDWATER ELEVATION (FEET)
- (NM)** NOT MEASURED

- ### NOTES
1. BASE MAP IMAGERY FROM GOOGLE EARTH PRO, 2018.
 2. WELL LOCATIONS SURVEYED BY ROWE PROFESSIONAL SERVICES COMPANY ON 11/4/2015.
 3. NOAA/NATIONAL OCEANIC SERVICE GREAT LAKES GAUGING STATION, ESSEXVILLE, MI (ID: 9075035).
 4. GROUNDWATER ELEVATION DATA RECORDED MARCH 11, 2019.
 5. GROUNDWATER ELEVATIONS DISPLAYED IN FEET RELATIVE TO THE NORTH AMERICAN VERTICAL DATUM OF 1988.
 6. DATA FROM APRIL 7, 2019. NO DATA RECORDED AT NOAA GAUGING STATION ON APRIL 8, 2019.

PROJECT:		CONSUMERS ENERGY COMPANY DE KARN POWER PLANT ESSEXVILLE, MICHIGAN	
TITLE:		SHALLOW GROUNDWATER CONTOUR MAP APRIL 2019	
DRAWN BY:	S. MAJOR	PROJ NO.:	322173-001
CHECKED BY:	J. KRENZ	FIGURE 3	
APPROVED BY:	D. LITZ		
DATE:	JANUARY 2020		
		1540 Eisenhower Place Ann Arbor, MI 48108-3284 Phone: 734.971.7080 www.trccompanies.com	
FILE NO.:		322172_3-004-02.mxd	

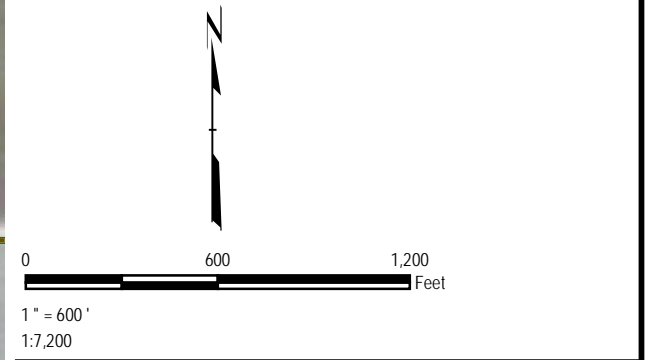


LEGEND

- DEK BOTTOM ASH POND & LINED IMPOUNDMENT MONITORING WELL
- DEK BOTTOM ASH POND MONITORING WELL
- DEK LINED IMPOUNDMENT MONITORING WELL
- DECOMMISSIONED MONITORING WELL
- MONITORING WELL (STATIC WATER LEVEL ONLY)
- SURFACE WATER GAUGING STATION
- NATURE AND EXTENT WELL
- SLURRY WALL (APPROXIMATE)
- GROUNDWATER ELEVATION CONTOUR (1' INTERVAL, DASHED WHERE INFERRED)
- EXTENT OF GEOSYNTHETICS (KARN LINED IMPOUNDMENT)
- (580.21) GROUNDWATER ELEVATION (FEET)
- (NM) NOT MEASURED

NOTES

1. BASE MAP IMAGERY FROM GOOGLE EARTH PRO, 2018.
2. WELL LOCATIONS SURVEYED BY ROWE PROFESSIONAL SERVICES COMPANY ON 11/4/2015.
3. NOAA/NATIONAL OCEANIC SERVICE GREAT LAKES GAUGING STATION, ESSEXVILLE, MI (ID: 9075035).
4. A SINGLE WELL SYMBOL IS SHOWN FOR WELL PAIRS MW-01/MW-02 AND MW-03/MW-04 AS THE WELLS ARE LOCATED WITHIN 3-FT OF EACH OTHER.
5. GROUND WATER ELEVATIONS DISPLAYED IN FEET RELATIVE TO THE NORTH AMERICAN VERTICAL DATUM OF 1988.



PROJECT:		CONSUMERS ENERGY COMPANY DE KARN POWER PLANT ESSEXVILLE, MICHIGAN	
TITLE:		SHALLOW GROUNDWATER CONTOUR MAP OCTOBER 2019	
DRAWN BY:	S. MAJOR	PROJ NO.:	322172-001
CHECKED BY:	J. KRENZ	FIGURE 4	
APPROVED BY:	D. LITZ		
DATE:	JANUARY 2020		
		1540 Eisenhower Place Ann Arbor, MI 48108-3284 Phone: 734.971.7080 www.trccompanies.com	
FILE NO.:		322172_3-005-02.mxd	



LEGEND

- DEK BOTTOM ASH POND & LINED IMPOUNDMENT MONITORING WELL
- DEK BOTTOM ASH POND MONITORING WELL
- DEK LINED IMPOUNDMENT MONITORING WELL
- DECOMMISSIONED MONITORING WELL
- MONITORING WELL (STATIC ONLY)
- SURFACE WATER GAUGING STATION
- NATURE AND EXTENT WELL
- SLURRY WALL (APPROXIMATE)
- EXTENT OF GEOSYNTHETICS (KARN LINED IMPOUNDMENT)
- GROUNDWATER ELEVATION CONTOUR (1' INTERVAL, DASHED WHERE INFERRED)
- (580.50)** GROUNDWATER ELEVATION (FEET)
- (NM)** NOT MEASURED

- ### NOTES
- BASE MAP IMAGERY FROM GOOGLE EARTH PRO, 2018.
 - WELL LOCATIONS SURVEYED BY ROWE PROFESSIONAL SERVICES COMPANY ON 11/4/2015.
 - NOA/NATIONAL OCEANIC SERVICE GREAT LAKES GAUGING STATION, ESSEXVILLE, MI (ID: 9075035).
 - GROUNDWATER ELEVATIONS DISPLAYED IN FEET RELATIVE TO THE NORTH AMERICAN VERTICAL DATUM OF 1988.

0 600 1,200 Feet

1" = 600'
1:7,200

PROJECT:		CONSUMERS ENERGY COMPANY DE KARN POWER PLANT ESSEXVILLE, MICHIGAN	
TITLE:		SHALLOW GROUNDWATER CONTOUR MAP MAY 11, 2020	
DRAWN BY:	S. MAJOR	PROJ NO.:	367388.0001
CHECKED BY:	J. KRENZ	FIGURE 3	
APPROVED BY:	D. LITZ		
DATE:	JULY 2020		

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Phone: 734.971.7080
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FILE NO.: 367388-001-006.mxd

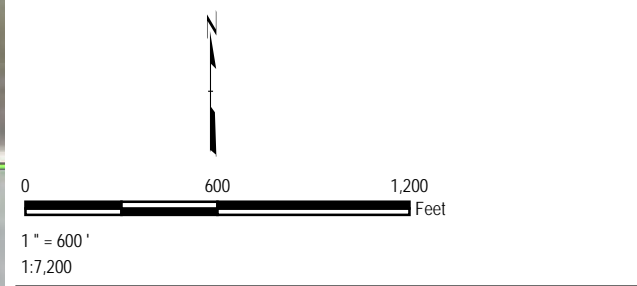
TRC - GIS
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 Map Rotation: 0
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 Path: S:\PROJECTS\Consumers Energy Company\Michigan\CCR_GW\2017_26976767367388-001-012.mxd



LEGEND

- DEK BOTTOM ASH POND & LINED IMPOUNDMENT MONITORING WELL
- DEK BOTTOM ASH POND MONITORING WELL
- DEK LINED IMPOUNDMENT MONITORING WELL
- DECOMMISSIONED MONITORING WELL
- MONITORING WELL (STATIC ONLY)
- SURFACE WATER GAUGING STATION
- NATURE AND EXTENT WELL
- SLURRY WALL (APPROXIMATE)
- LINED IMPOUNDMENT (COVENANT BOUNDARY)
- GROUNDWATER ELEVATION CONTOUR (1' INTERVAL, DASHED WHERE INFERRED)
- (580.50)** GROUNDWATER ELEVATION (FEET)

- ### NOTES
1. BASE MAP IMAGERY FROM GOOGLE EARTH PRO, 2018.
 2. WELL LOCATIONS SURVEYED BY ROWE PROFESSIONAL SERVICES COMPANY ON 11/4/2015.
 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.



PROJECT:		CONSUMERS ENERGY COMPANY DE KARN POWER PLANT ESSEXVILLE, MICHIGAN	
TITLE:		SHALLOW GROUNDWATER CONTOUR MAP OCTOBER 5, 2020	
DRAWN BY:	S. MAJOR	PROJ NO.:	367388.0001
CHECKED BY:	J. KRENZ	FIGURE 3	
APPROVED BY:	D. LITZ		
DATE:	JANUARY 2021		
		1540 Eisenhower Place Ann Arbor, MI 48108-3284 Phone: 734.971.7080 www.trccompanies.com	
FILE NO.:		367388-001-012.mxd	

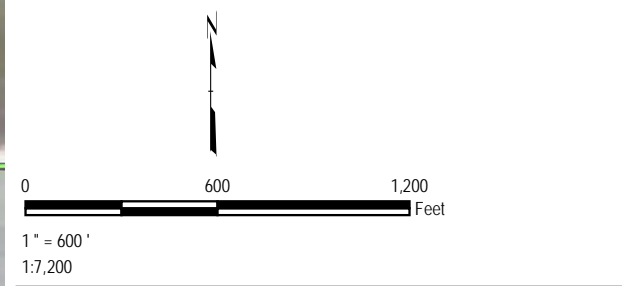
Plot Date: 7/28/2021, 12:48:26 PM by ADAIR -- LAYOUT: ANS1B(11"x17")
 Path: S:\PROJECTS\Consumers Energy Company\Michigan\CCR_GW\2017_26976\1 DEKARN\2021_MIXDS\2021_MIXDS\2021-012.mxd
 Coordinate System: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl (Foot)
 Map Rotation: 0
 TRC - GIS



LEGEND

- DEK BOTTOM ASH POND & LINED IMPOUNDMENT MONITORING WELL
- DEK BOTTOM ASH POND MONITORING WELL
- DEK LINED IMPOUNDMENT MONITORING WELL
- DECOMMISSIONED MONITORING WELL
- MONITORING WELL (STATIC ONLY)
- SURFACE WATER GAUGING STATION
- NATURE AND EXTENT WELL
- SLURRY WALL (APPROXIMATE)
- LINED IMPOUNDMENT (COVENANT BOUNDARY)
- GROUNDWATER ELEVATION CONTOUR (1' INTERVAL, DASHED WHERE INFERRED)
- (580.50) GROUNDWATER ELEVATION (FEET)

- ### NOTES
- BASE MAP IMAGERY FROM GOOGLE EARTH PRO, 2018.
 - WELL LOCATIONS SURVEYED BY ROWE PROFESSIONAL SERVICES COMPANY ON 11/4/2015.
 - NOA/NATIONAL OCEANIC SERVICE GREAT LAKES GAUGING STATION, ESSEXVILLE, MI (ID: 9075035).
 - GROUNDWATER ELEVATIONS DISPLAYED IN FEET RELATIVE TO THE NORTH AMERICAN VERTICAL DATUM OF 1988.



PROJECT:		CONSUMERS ENERGY COMPANY DE KARN POWER PLANT ESSEXVILLE, MICHIGAN	
TITLE:		SHALLOW GROUNDWATER CONTOUR MAP MAY 3, 2021	
DRAWN BY:	A. ADAIR	PROJ NO.:	418425.0001
CHECKED BY:	J. KRENZ	FIGURE 3	
APPROVED BY:	L. DARBY		
DATE:	JULY 2021		

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FILE NO.: 418425-201-012.mxd

Plot Date: 7/28/2021, 12:48:26 PM by ADAIR -- LAYOUT: ANSI B(11"x17")
 Path: S:\PROJECTS\Consumers Energy Company\Michigan\CCR_GW\2017_26976\1 DEKARN\2021_MXD\2021_002_MAY18\25-201-012.mxd
 Coordinate System: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl (Foot)
 Map Rotation: 0
 TRC - GIS



LEGEND

- DEK BOTTOM ASH POND & LINED IMPOUNDMENT MONITORING WELL
- DEK BOTTOM ASH POND MONITORING WELL
- DEK LINED IMPOUNDMENT MONITORING WELL
- DECOMMISSIONED MONITORING WELL
- MONITORING WELL (STATIC ONLY)
- SURFACE WATER GAUGING STATION
- NATURE AND EXTENT WELL
- SLURRY WALL (APPROXIMATE)
- LINED IMPOUNDMENT (COVENANT BOUNDARY)
- GROUNDWATER ELEVATION CONTOUR (1' INTERVAL, DASHED WHERE INFERRED)
- (580.50) GROUNDWATER ELEVATION (FEET)

NOTES

- BASE MAP IMAGERY FROM GOOGLE EARTH PRO, 2018.
- WELL LOCATIONS SURVEYED BY ROWE PROFESSIONAL SERVICES COMPANY ON 11/4/2015.
- NOAA/NATIONAL OCEANIC SERVICE GREAT LAKES GAUGING STATION, ESSEXVILLE, MI (ID: 9075035).
- GROUNDWATER ELEVATIONS DISPLAYED IN FEET RELATIVE TO THE NORTH AMERICAN VERTICAL DATUM OF 1988.

0 600 1,200 Feet
 1" = 600'
 1:7,200

PROJECT: **CONSUMERS ENERGY COMPANY
 DE KARN POWER PLANT
 ESSEXVILLE, MICHIGAN**

TITLE: **SHALLOW GROUNDWATER CONTOUR MAP
 MAY 3, 2021**

DRAWN BY:	A. ADAIR	PROJ NO.:	418425.0001
CHECKED BY:	J. KRENZ	FIGURE 3	
APPROVED BY:	L. DARBY		
DATE:	JULY 2021		

TRC

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

FILE NO.: 418425-201-012.mxd

Appendix D Groundwater Monitoring System Certification

A CMS Energy Company

Date: January 24, 2022

To: Operating Record

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

RE: Groundwater Monitoring System Certification, §257.91(f)
DE Karn Power Plant, Bottom Ash Pond CCR Unit

Introduction

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

Groundwater Monitoring System

A groundwater monitoring system has been established for the DE Karn Bottom Ash Pond CCR Unit, which established the following locations for determining background groundwater quality and detection monitoring. The downgradient monitoring network accurately represents the quality of groundwater passing the waste boundary and ensures detection of groundwater contamination in the uppermost aquifer based on the groundwater flow regime.

Background:

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

Downgradient Monitoring Wells:

DEK-MW-15002
DEK-MW-15005
DEK-MW-15006
DEK-MW-18001

**“Groundwater Monitoring System Certification
DEK Bottom Ash Pond CCR Unit”
January 24, 2022
Page 2**

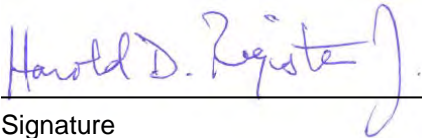
Other Assessment Monitoring Wells (currently located upgradient)¹:
DEK-MW-15003
DEK-MW-15004

Provided herein, as required by §257.91(f), is certification from a qualified professional engineer that the groundwater monitoring system at Consumers Energy DE Karn Bottom Ash Pond CCR Unit meets the requirements of §257.91.

CERTIFICATION

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

I hereby certify that having reviewed the 2019 Annual Groundwater Monitoring Report and 2020 Annual Groundwater Monitoring Report for the DE Karn Bottom Ash Pond CCR Unit, and being familiar with the provisions of Title 40 of the Code of Federal Regulations §257.91 (40 CFR Part 257.91), I attest that this Groundwater Monitoring System has been designed and constructed to meet the requirements of 40 CFR 257.91. The report is accurate and has been prepared in accordance with good engineering practices, including the consideration of applicable industry standards, and with the requirements of 40 CFR Part 257.91.



Signature

January 24, 2022

Date of Certification

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

Name

6201056266

Professional Engineer Certification Number



¹ DEK-MW-15003 and DEK-MW-15004 were located downgradient when the pond was active. These wells are now located upgradient of groundwater flow across the pond after groundwater flow equilibrated post-decommissioning. These two wells will continue to be used to monitor post-decommissioning changes in groundwater quality, but not as downgradient compliance wells.

Appendix E

Laboratory Analytical Reports

To: CDBatts, Karn/Weadock

From: EBlaj, T-258

Date: November 01, 2021

Subject: RCRA GROUNDWATER MONITORING – DEK-JCW BACKGROUND WELLS – 2021 Q4

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

Darby Litz, Project Manager
TRC Companies, Inc.
1540 Eisenhower Place
Ann Arbor, MI 48108

Chemistry Project: 21-1171

TRC Environmental, Inc. conducted groundwater monitoring at the Karn/Weadock Background Wells area on 10/06/2021 and 10/07/2021, for the 4th Quarter monitoring requirement, as specified in the Sampling and Analysis Plan for the site. The samples were received for analysis by the Chemistry department of Laboratory Services on 10/07/2021.

The report that follows presents the results of the requested analytical testing; the results apply only to the samples as received. All samples have been analyzed in accordance with the 2016 TNI Standard and the applicable A2LA accreditation scope for Laboratory Services. Any exceptions to applicable test method criteria and standard compliance are noted in the Case Narrative, or flagged with applicable qualifiers in the analytical results section.

Reviewed and approved by:

Emil Blaj
Sr. Technical Analyst
Project Lead



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CASE NARRATIVE

I. Sample Receipt

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

II. Methodology

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

III. Results/Quality Control

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

DEFINITIONS / QUALIFIERS

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

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

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

Customer Name: Karn/Weadock Complex
Work Order ID: Q4_2021 DEK & JCW RCRA Background Wells
Date Received: 10/7/2021
Chemistry Project: 21-1171

<u>Sample #</u>	<u>Field Sample ID</u>	<u>Matrix</u>	<u>Sample Date</u>	<u>Site</u>
21-1171-01	MW-15002	Groundwater	10/07/2021 09:08 AM	DEK JCW Background
21-1171-02	MW-15008	Groundwater	10/06/2021 04:02 PM	DEK JCW Background
21-1171-03	MW-15016	Groundwater	10/07/2021 10:10 AM	DEK JCW Background
21-1171-04	MW-15019	Groundwater	10/07/2021 08:10 AM	DEK JCW Background
21-1171-05	DUP-Background	Groundwater	10/07/2021 12:00 AM	DEK JCW Background
21-1171-06	FB-MW-15002	Water	10/07/2021 09:08 AM	DEK JCW Background

Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **DEK JCW Background**
 Field Sample ID: **MW-15002**
 Lab Sample ID: 21-1171-01
 Matrix: Groundwater

Laboratory Project: **21-1171**
 Collect Date: 10/07/2021
 Collect Time: 09:08 AM

Mercury by EPA 7470A, Total, Aqueous

Aliquot #: 21-1171-01-C01-A01 Analyst: CLH

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Mercury	ND		ug/L	0.2	10/14/2021	AB21-1014-03

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

Aliquot #: 21-1171-01-C01-A02 Analyst: EB

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Antimony	ND		ug/L	1.0	10/28/2021	AB21-1028-02
Arsenic	3		ug/L	1.0	10/28/2021	AB21-1028-02
Barium	85		ug/L	5.0	10/28/2021	AB21-1028-02
Beryllium	ND		ug/L	1.0	10/28/2021	AB21-1028-02
Boron	51		ug/L	20.0	10/28/2021	AB21-1028-02
Cadmium	ND		ug/L	0.2	10/28/2021	AB21-1028-02
Calcium	76800		ug/L	1000.0	10/28/2021	AB21-1028-02
Chromium	ND		ug/L	1.0	10/28/2021	AB21-1028-02
Cobalt	ND		ug/L	6.0	10/28/2021	AB21-1028-02
Copper	ND		ug/L	1.0	10/28/2021	AB21-1028-02
Iron	2810		ug/L	20.0	10/28/2021	AB21-1028-02
Lead	ND		ug/L	1.0	10/28/2021	AB21-1028-02
Lithium	ND		ug/L	10.0	10/28/2021	AB21-1028-02
Magnesium	8530		ug/L	1000.0	10/28/2021	AB21-1028-02
Molybdenum	ND		ug/L	5.0	10/28/2021	AB21-1028-02
Nickel	4		ug/L	2.0	10/28/2021	AB21-1028-02
Potassium	1240		ug/L	100.0	10/28/2021	AB21-1028-02
Selenium	ND		ug/L	1.0	10/28/2021	AB21-1028-02
Silver	ND		ug/L	0.2	10/28/2021	AB21-1028-02
Sodium	138000		ug/L	1000.0	10/28/2021	AB21-1028-02
Thallium	ND		ug/L	2.0	10/28/2021	AB21-1028-02
Vanadium	ND		ug/L	2.0	10/28/2021	AB21-1028-02
Zinc	ND		ug/L	10.0	10/28/2021	AB21-1028-02

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

Aliquot #: 21-1171-01-C02-A01 Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Chloride	146000		ug/L	1000.0	10/18/2021	AB21-1014-08
Fluoride	ND		ug/L	1000.0	10/14/2021	AB21-1014-08
Sulfate	3760		ug/L	1000.0	10/14/2021	AB21-1014-08

Total Dissolved Solids by SM 2540C

Aliquot #: 21-1171-01-C03-A01 Analyst: CLH

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Total Dissolved Solids	290		mg/L	10.0	10/11/2021	AB21-1011-04



Analytical Report

Report Date: 11/01/21

Laboratory Services
A CENTURY OF EXCELLENCE

Sample Site: **DEK JCW Background**
Field Sample ID: **MW-15002**
Lab Sample ID: 21-1171-01
Matrix: Groundwater

Laboratory Project: **21-1171**
Collect Date: 10/07/2021
Collect Time: 09:08 AM

Alkalinity by SM 2320B

Aliquot #: 21-1171-01-C04-A01

Analyst: DLS

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Alkalinity Total	277000		ug/L	10000.0	10/14/2021	AB21-1014-10
Alkalinity Bicarbonate	277000		ug/L	10000.0	10/14/2021	AB21-1014-10
Alkalinity Carbonate	ND		ug/L	10000.0	10/14/2021	AB21-1014-10

Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **DEK JCW Background**
 Field Sample ID: **MW-15008**
 Lab Sample ID: 21-1171-02
 Matrix: Groundwater

Laboratory Project: **21-1171**
 Collect Date: 10/06/2021
 Collect Time: 04:02 PM

Mercury by EPA 7470A, Total, Aqueous

Aliquot #: 21-1171-02-C01-A01 Analyst: CLH

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Mercury	ND		ug/L	0.2	10/14/2021	AB21-1014-03

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

Aliquot #: 21-1171-02-C01-A02 Analyst: EB

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Antimony	ND		ug/L	1.0	10/28/2021	AB21-1028-02
Arsenic	3		ug/L	1.0	10/28/2021	AB21-1028-02
Barium	65		ug/L	5.0	10/28/2021	AB21-1028-02
Beryllium	ND		ug/L	1.0	10/28/2021	AB21-1028-02
Boron	204		ug/L	20.0	10/28/2021	AB21-1028-02
Cadmium	ND		ug/L	0.2	10/28/2021	AB21-1028-02
Calcium	116000		ug/L	1000.0	10/28/2021	AB21-1028-02
Chromium	2		ug/L	1.0	10/28/2021	AB21-1028-02
Cobalt	ND		ug/L	6.0	10/28/2021	AB21-1028-02
Copper	ND		ug/L	1.0	10/28/2021	AB21-1028-02
Iron	14500		ug/L	20.0	10/28/2021	AB21-1028-02
Lead	ND		ug/L	1.0	10/28/2021	AB21-1028-02
Lithium	30		ug/L	10.0	10/28/2021	AB21-1028-02
Magnesium	15800		ug/L	1000.0	10/28/2021	AB21-1028-02
Molybdenum	ND		ug/L	5.0	10/28/2021	AB21-1028-02
Nickel	6		ug/L	2.0	10/28/2021	AB21-1028-02
Potassium	3170		ug/L	100.0	10/28/2021	AB21-1028-02
Selenium	ND		ug/L	1.0	10/28/2021	AB21-1028-02
Silver	ND		ug/L	0.2	10/28/2021	AB21-1028-02
Sodium	168000		ug/L	1000.0	10/28/2021	AB21-1028-02
Thallium	ND		ug/L	2.0	10/28/2021	AB21-1028-02
Vanadium	6		ug/L	2.0	10/28/2021	AB21-1028-02
Zinc	ND		ug/L	10.0	10/28/2021	AB21-1028-02

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

Aliquot #: 21-1171-02-C02-A01 Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Chloride	197000		ug/L	1000.0	10/18/2021	AB21-1014-08
Fluoride	ND		ug/L	1000.0	10/14/2021	AB21-1014-08
Sulfate	11600		ug/L	1000.0	10/14/2021	AB21-1014-08

Total Dissolved Solids by SM 2540C

Aliquot #: 21-1171-02-C03-A01 Analyst: CLH

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Total Dissolved Solids	810		mg/L	10.0	10/11/2021	AB21-1011-04



Analytical Report

Report Date: 11/01/21

Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **DEK JCW Background**
Field Sample ID: **MW-15008**
Lab Sample ID: 21-1171-02
Matrix: Groundwater

Laboratory Project: **21-1171**
Collect Date: 10/06/2021
Collect Time: 04:02 PM

Alkalinity by SM 2320B

Aliquot #: 21-1171-02-C04-A01

Analyst: DLS

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Alkalinity Total	361000		ug/L	10000.0	10/14/2021	AB21-1014-10
Alkalinity Bicarbonate	361000		ug/L	10000.0	10/14/2021	AB21-1014-10
Alkalinity Carbonate	ND		ug/L	10000.0	10/14/2021	AB21-1014-10

Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **DEK JCW Background**
 Field Sample ID: **MW-15016**
 Lab Sample ID: 21-1171-03
 Matrix: Groundwater

Laboratory Project: **21-1171**
 Collect Date: 10/07/2021
 Collect Time: 10:10 AM

Mercury by EPA 7470A, Total, Aqueous

Aliquot #: 21-1171-03-C01-A01 Analyst: CLH

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Mercury	ND		ug/L	0.2	10/14/2021	AB21-1014-03

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

Aliquot #: 21-1171-03-C01-A02 Analyst: EB

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Antimony	ND		ug/L	1.0	10/28/2021	AB21-1028-02
Arsenic	8		ug/L	1.0	10/28/2021	AB21-1028-02
Barium	63		ug/L	5.0	10/28/2021	AB21-1028-02
Beryllium	ND		ug/L	1.0	10/28/2021	AB21-1028-02
Boron	661		ug/L	20.0	10/28/2021	AB21-1028-02
Cadmium	ND		ug/L	0.2	10/28/2021	AB21-1028-02
Calcium	236000		ug/L	1000.0	10/28/2021	AB21-1028-02
Chromium	ND		ug/L	1.0	10/28/2021	AB21-1028-02
Cobalt	ND		ug/L	6.0	10/28/2021	AB21-1028-02
Copper	1		ug/L	1.0	10/28/2021	AB21-1028-02
Iron	2670		ug/L	20.0	10/28/2021	AB21-1028-02
Lead	ND		ug/L	1.0	10/28/2021	AB21-1028-02
Lithium	85		ug/L	10.0	10/28/2021	AB21-1028-02
Magnesium	26400		ug/L	1000.0	10/28/2021	AB21-1028-02
Molybdenum	7		ug/L	5.0	10/28/2021	AB21-1028-02
Nickel	14		ug/L	2.0	10/28/2021	AB21-1028-02
Potassium	20800		ug/L	100.0	10/28/2021	AB21-1028-02
Selenium	2		ug/L	1.0	10/28/2021	AB21-1028-02
Silver	ND		ug/L	0.2	10/28/2021	AB21-1028-02
Sodium	96000		ug/L	1000.0	10/28/2021	AB21-1028-02
Thallium	ND		ug/L	2.0	10/28/2021	AB21-1028-02
Vanadium	ND		ug/L	2.0	10/28/2021	AB21-1028-02
Zinc	ND		ug/L	10.0	10/28/2021	AB21-1028-02

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

Aliquot #: 21-1171-03-C02-A01 Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Chloride	138000		ug/L	1000.0	10/18/2021	AB21-1014-08
Fluoride	ND		ug/L	1000.0	10/14/2021	AB21-1014-08
Sulfate	433000		ug/L	1000.0	10/18/2021	AB21-1014-08

Total Dissolved Solids by SM 2540C

Aliquot #: 21-1171-03-C03-A01 Analyst: CLH

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Total Dissolved Solids	1140		mg/L	10.0	10/11/2021	AB21-1011-04



Analytical Report

Report Date: 11/01/21

Laboratory Services
A CENTURY OF EXCELLENCE

Sample Site: **DEK JCW Background**
Field Sample ID: **MW-15016**
Lab Sample ID: 21-1171-03
Matrix: Groundwater

Laboratory Project: **21-1171**
Collect Date: 10/07/2021
Collect Time: 10:10 AM

Alkalinity by SM 2320B

Aliquot #: 21-1171-03-C04-A01

Analyst: DLS

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Alkalinity Total	214000		ug/L	10000.0	10/14/2021	AB21-1014-10
Alkalinity Bicarbonate	214000		ug/L	10000.0	10/14/2021	AB21-1014-10
Alkalinity Carbonate	ND		ug/L	10000.0	10/14/2021	AB21-1014-10

Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **DEK JCW Background**
 Field Sample ID: **MW-15019**
 Lab Sample ID: 21-1171-04
 Matrix: Groundwater

Laboratory Project: **21-1171**
 Collect Date: 10/07/2021
 Collect Time: 08:10 AM

Mercury by EPA 7470A, Total, Aqueous

Aliquot #: 21-1171-04-C01-A01

Analyst: CLH

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Mercury	ND		ug/L	0.2	10/14/2021	AB21-1014-03

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

Aliquot #: 21-1171-04-C01-A02

Analyst: EB

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Antimony	ND		ug/L	1.0	10/28/2021	AB21-1028-02
Arsenic	3		ug/L	1.0	10/28/2021	AB21-1028-02
Barium	283		ug/L	5.0	10/28/2021	AB21-1028-02
Beryllium	ND		ug/L	1.0	10/28/2021	AB21-1028-02
Boron	351		ug/L	20.0	10/28/2021	AB21-1028-02
Cadmium	ND		ug/L	0.2	10/28/2021	AB21-1028-02
Calcium	165000		ug/L	1000.0	10/28/2021	AB21-1028-02
Chromium	ND		ug/L	1.0	10/28/2021	AB21-1028-02
Cobalt	ND		ug/L	6.0	10/28/2021	AB21-1028-02
Copper	ND		ug/L	1.0	10/28/2021	AB21-1028-02
Iron	20900		ug/L	20.0	10/28/2021	AB21-1028-02
Lead	ND		ug/L	1.0	10/28/2021	AB21-1028-02
Lithium	15		ug/L	10.0	10/28/2021	AB21-1028-02
Magnesium	35200		ug/L	1000.0	10/28/2021	AB21-1028-02
Molybdenum	ND		ug/L	5.0	10/28/2021	AB21-1028-02
Nickel	7		ug/L	2.0	10/28/2021	AB21-1028-02
Potassium	2120		ug/L	100.0	10/28/2021	AB21-1028-02
Selenium	ND		ug/L	1.0	10/28/2021	AB21-1028-02
Silver	ND		ug/L	0.2	10/28/2021	AB21-1028-02
Sodium	238000		ug/L	1000.0	10/28/2021	AB21-1028-02
Thallium	ND		ug/L	2.0	10/28/2021	AB21-1028-02
Vanadium	2		ug/L	2.0	10/28/2021	AB21-1028-02
Zinc	ND		ug/L	10.0	10/28/2021	AB21-1028-02

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

Aliquot #: 21-1171-04-C02-A01

Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Chloride	363000		ug/L	1000.0	10/18/2021	AB21-1014-08
Fluoride	ND		ug/L	1000.0	10/14/2021	AB21-1014-08
Sulfate	58300		ug/L	1000.0	10/14/2021	AB21-1014-08

Total Dissolved Solids by SM 2540C

Aliquot #: 21-1171-04-C03-A01

Analyst: CLH

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Total Dissolved Solids	1130		mg/L	10.0	10/11/2021	AB21-1011-04



Analytical Report

Report Date: 11/01/21

Laboratory Services
A CENTURY OF EXCELLENCE

Sample Site: **DEK JCW Background**
Field Sample ID: **MW-15019**
Lab Sample ID: 21-1171-04
Matrix: Groundwater

Laboratory Project: **21-1171**
Collect Date: 10/07/2021
Collect Time: 08:10 AM

Alkalinity by SM 2320B

Aliquot #: 21-1171-04-C04-A01

Analyst: DLS

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Alkalinity Total	432000		ug/L	10000.0	10/15/2021	AB21-1015-20
Alkalinity Bicarbonate	432000		ug/L	10000.0	10/15/2021	AB21-1015-20
Alkalinity Carbonate	ND		ug/L	10000.0	10/15/2021	AB21-1015-20

Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **DEK JCW Background**
 Field Sample ID: **DUP-Background**
 Lab Sample ID: 21-1171-05
 Matrix: Groundwater

Laboratory Project: **21-1171**
 Collect Date: 10/07/2021
 Collect Time: 12:00 AM

Mercury by EPA 7470A, Total, Aqueous

Aliquot #: 21-1171-05-C01-A01 Analyst: CLH

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Mercury	ND		ug/L	0.2	10/14/2021	AB21-1014-06

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

Aliquot #: 21-1171-05-C01-A02 Analyst: EB

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Antimony	ND		ug/L	1.0	10/28/2021	AB21-1028-02
Arsenic	3		ug/L	1.0	10/28/2021	AB21-1028-02
Barium	305		ug/L	5.0	10/28/2021	AB21-1028-02
Beryllium	ND		ug/L	1.0	10/28/2021	AB21-1028-02
Boron	338		ug/L	20.0	10/28/2021	AB21-1028-02
Cadmium	ND		ug/L	0.2	10/28/2021	AB21-1028-02
Calcium	170000		ug/L	1000.0	10/28/2021	AB21-1028-02
Chromium	ND		ug/L	1.0	10/28/2021	AB21-1028-02
Cobalt	ND		ug/L	6.0	10/28/2021	AB21-1028-02
Copper	ND		ug/L	1.0	10/28/2021	AB21-1028-02
Iron	21200		ug/L	20.0	10/28/2021	AB21-1028-02
Lead	ND		ug/L	1.0	10/28/2021	AB21-1028-02
Lithium	16		ug/L	10.0	10/28/2021	AB21-1028-02
Magnesium	34700		ug/L	1000.0	10/28/2021	AB21-1028-02
Molybdenum	ND		ug/L	5.0	10/28/2021	AB21-1028-02
Nickel	8		ug/L	2.0	10/28/2021	AB21-1028-02
Potassium	2340		ug/L	100.0	10/28/2021	AB21-1028-02
Selenium	ND		ug/L	1.0	10/28/2021	AB21-1028-02
Silver	ND		ug/L	0.2	10/28/2021	AB21-1028-02
Sodium	240000		ug/L	1000.0	10/28/2021	AB21-1028-02
Thallium	ND		ug/L	2.0	10/28/2021	AB21-1028-02
Vanadium	2		ug/L	2.0	10/28/2021	AB21-1028-02
Zinc	ND		ug/L	10.0	10/28/2021	AB21-1028-02

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

Aliquot #: 21-1171-05-C02-A01 Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Chloride	350000		ug/L	1000.0	10/18/2021	AB21-1014-08
Fluoride	ND		ug/L	1000.0	10/14/2021	AB21-1014-08
Sulfate	54700		ug/L	1000.0	10/14/2021	AB21-1014-08

Total Dissolved Solids by SM 2540C

Aliquot #: 21-1171-05-C03-A01 Analyst: CLH

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Total Dissolved Solids	1220		mg/L	10.0	10/11/2021	AB21-1011-04



Analytical Report

Report Date: 11/01/21

Laboratory Services
A CENTURY OF EXCELLENCE

Sample Site: **DEK JCW Background**
Field Sample ID: **DUP-Background**
Lab Sample ID: 21-1171-05
Matrix: Groundwater

Laboratory Project: **21-1171**
Collect Date: 10/07/2021
Collect Time: 12:00 AM

Alkalinity by SM 2320B

Aliquot #: 21-1171-05-C04-A01

Analyst: DLS

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Alkalinity Total	438000		ug/L	10000.0	10/15/2021	AB21-1015-20
Alkalinity Bicarbonate	438000		ug/L	10000.0	10/15/2021	AB21-1015-20
Alkalinity Carbonate	ND		ug/L	10000.0	10/15/2021	AB21-1015-20

Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **DEK JCW Background**
 Field Sample ID: **FB-MW-15002**
 Lab Sample ID: 21-1171-06
 Matrix: Water

Laboratory Project: **21-1171**
 Collect Date: 10/07/2021
 Collect Time: 09:08 AM

Mercury by EPA 7470A, Total, Aqueous

Aliquot #: 21-1171-06-C01-A01 Analyst: CLH

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Mercury	ND		ug/L	0.2	10/14/2021	AB21-1014-06

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

Aliquot #: 21-1171-06-C01-A02 Analyst: EB

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Antimony	ND		ug/L	1.0	10/28/2021	AB21-1028-02
Arsenic	ND		ug/L	1.0	10/28/2021	AB21-1028-02
Barium	ND		ug/L	5.0	10/28/2021	AB21-1028-02
Beryllium	ND		ug/L	1.0	10/28/2021	AB21-1028-02
Boron	ND		ug/L	20.0	10/28/2021	AB21-1028-02
Cadmium	ND		ug/L	0.2	10/28/2021	AB21-1028-02
Calcium	ND		ug/L	1000.0	10/28/2021	AB21-1028-02
Chromium	ND		ug/L	1.0	10/28/2021	AB21-1028-02
Cobalt	ND		ug/L	6.0	10/28/2021	AB21-1028-02
Copper	ND		ug/L	1.0	10/28/2021	AB21-1028-02
Iron	ND		ug/L	20.0	10/28/2021	AB21-1028-02
Lead	ND		ug/L	1.0	10/28/2021	AB21-1028-02
Lithium	ND		ug/L	10.0	10/28/2021	AB21-1028-02
Magnesium	ND		ug/L	1000.0	10/28/2021	AB21-1028-02
Molybdenum	ND		ug/L	5.0	10/28/2021	AB21-1028-02
Nickel	ND		ug/L	2.0	10/28/2021	AB21-1028-02
Potassium	ND		ug/L	100.0	10/28/2021	AB21-1028-02
Selenium	ND		ug/L	1.0	10/28/2021	AB21-1028-02
Silver	ND		ug/L	0.2	10/28/2021	AB21-1028-02
Sodium	ND		ug/L	1000.0	10/28/2021	AB21-1028-02
Thallium	ND		ug/L	2.0	10/28/2021	AB21-1028-02
Vanadium	ND		ug/L	2.0	10/28/2021	AB21-1028-02
Zinc	ND		ug/L	10.0	10/28/2021	AB21-1028-02

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

Aliquot #: 21-1171-06-C02-A01 Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Chloride	ND		ug/L	1000.0	10/14/2021	AB21-1014-08
Fluoride	ND		ug/L	1000.0	10/14/2021	AB21-1014-08
Sulfate	ND		ug/L	1000.0	10/14/2021	AB21-1014-08

Data Qualifiers	Exception Summary
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No exceptions occurred.

TITLE: SAMPLE LOG-IN – SHIPMENT INSPECTION FORM

Project Log-In Number: 21-1171

Inspection Date: 10.8.21 Inspection By: LH

Sample Origin/Project Name: Background

Shipment Delivered By: Enter the type of shipment carrier.

Pony _____ FedEx _____ UPS _____ USPS _____ Airborne _____

Other/Hand Carry (whom) TRC

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

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

Cooler (1) Cardboard Box _____ Custom Case _____ Envelope/Mailer _____

Loose/Unpackaged Containers _____ Other _____

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

Damaged Shipment Observed: None Dented _____ Leaking _____

Other _____

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

Shipping Containers Received: Opened _____ Sealed

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

CoC Work Request _____ Air Data Sheet _____ Other _____

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

As-Received Temperature Range 0154102/16.3.22 Samples Received on Ice: Yes No _____

M&TE # and Expiration 5.8°C 2

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

Container Type	Water	Soil	Other	Broken	Leaking
VOA (40mL or 60mL)	<u>10</u>	_____	_____	_____	_____
Quart/Liter (g/p)	_____	_____	_____	_____	_____
9-oz (amber glass jar)	_____	_____	_____	_____	_____
2-oz (amber glass)	_____	_____	_____	_____	_____
125 mL (plastic)	<u>12</u>	_____	_____	_____	_____
24 mL vial (glass)	_____	_____	_____	_____	_____
250 100 mL (plastic)	<u>5</u>	_____	_____	_____	_____
Other	_____	_____	_____	_____	_____

CHAIN OF CUSTODY

CONSUMERS ENERGY COMPANY – LABORATORY SERVICES



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

SAMPLING SITE: DEK & JCW Background- 2021 Q4				PROJECT NUMBER: 21-1171			ANALYSIS REQUESTED						Page 1 of 1				
SAMPLING TEAM: <i>Andrew W.</i>				DATE SHIPPED:		SITE SKETCHED ATTACHED? CIRCLE ONE: YES NO		Total Metals	Anions	TDS	Alkalinity	SEND REPORT TO: CDBatts					
												HD Register, TRC					
								PHONE: _____									
CE CONTROL #	SAMPLE DATE	SAMPLE TIME	SAMPLE MATRIX	SAMPLE DESCRIPTION / LOCATION		DEPTH (ft)	# OF CONTAINERS										REMARKS
21-1171-01	<i>10-7-21</i>	<i>0908</i>	GW	MW-15002			<i>5</i> <i>β</i>	X	X	X	X						
-02	<i>10-6-21</i>	<i>1602</i>	GW	MW-15008			<i>5</i> <i>3</i>	X	X	X	X						
-03	<i>10-7-21</i>	<i>1010</i>	GW	MW-15016			<i>5</i> <i>3</i>	X	X	X	X						
-04	<i>10-7-21</i>	<i>0810</i>	GW	MW-15019			<i>5</i> <i>3</i>	X	X	X	X						
-05	<i>10-7-21</i>		GW	DUP-Background			<i>5</i> <i>3</i>	X	X	X	X						
✓ -06	<i>10-7-21</i>	<i>0908</i>	W	FB- <i>MW-15002</i>			<i>2</i> <i>1</i>	X	X								
RELINQUISHED BY: (SIGNATURE)				DATE/TIME: <i>10/07/21 1530</i>		RECEIVED BY: (SIGNATURE) <i>[Signature]</i>		COMMENTS <i>5.8°C</i> <i>*015402</i>									
RELINQUISHED BY: (SIGNATURE)				DATE/TIME:		RECEIVED BY: (SIGNATURE)											
ORIGINAL TO LAB COPY TO CUSTOMER																	

To: CDBatts, Karn/Weadock

From: EBlaj, T-258

Date: October 31, 2021

Subject: RCRA GROUNDWATER MONITORING – DEK BOTTOM ASH POND WELLS – 2021 Q4

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

Darby Litz, Project Manager
TRC Companies, Inc.
1540 Eisenhower Place
Ann Arbor, MI 48108

Chemistry Project: 21-1168R

TRC Environmental, Inc. conducted groundwater monitoring at the DEKarn Bottom Ash Pond Wells area on 10/04/2021 for the 4th Quarter monitoring requirement, as specified in the Sampling and Analysis Plan for the site. The samples were received for analysis by the Chemistry department of Laboratory Services on 10/07/2021.

The report that follows presents the results of the requested analytical testing; the results apply only to the samples as received. All samples have been analyzed in accordance with the 2016 TNI Standard and the applicable A2LA accreditation scope for Laboratory Services. Any exceptions to applicable test method criteria and standard compliance are noted in the Case Narrative, or flagged with applicable qualifiers in the analytical results section.

Reviewed and approved by:

Emil Blaj
Sr. Technical Analyst
Project Lead



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CASE NARRATIVE

I. Sample Receipt

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

II. Methodology

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

III. Results/Quality Control

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

DEFINITIONS / QUALIFIERS

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

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

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

Customer Name: Karn/Weadock Complex
Work Order ID: Q4-2021 DEK RCRA Bottom Ash Pond Wells
Date Received: 10/7/2021
Chemistry Project: 21-1168

<u>Sample #</u>	<u>Field Sample ID</u>	<u>Matrix</u>	<u>Sample Date</u>	<u>Site</u>
21-1168-01	DEK-MW-15002	Groundwater	10/04/2021 01:37 PM	DEK Bottom Ash Pond
21-1168-02	DEK-MW-15004	Groundwater	10/04/2021 02:46 PM	DEK Bottom Ash Pond
21-1168-03	DEK-MW-15005	Groundwater	10/04/2021 11:39 AM	DEK Bottom Ash Pond
21-1168-04	DEK-MW-15006	Groundwater	10/04/2021 12:32 PM	DEK Bottom Ash Pond
21-1168-05	DUP-DEK-BAP	Groundwater	10/04/2021 12:00 PM	DEK Bottom Ash Pond
21-1168-06	FB-DEK-BAP	Water	10/04/2021 01:37 PM	DEK Bottom Ash Pond

Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **DEK Bottom Ash Pond**
 Field Sample ID: **DEK-MW-15002**
 Lab Sample ID: 21-1168-01
 Matrix: Groundwater

Laboratory Project: **21-1168**
 Collect Date: 10/04/2021
 Collect Time: 01:37 PM

Mercury by EPA 7470A, Total, Aqueous

Aliquot #: 21-1168-01-C01-A01 Analyst: CLH

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Mercury	ND		ug/L	0.2	10/14/2021	AB21-1014-03

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

Aliquot #: 21-1168-01-C01-A02 Analyst: EB

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Antimony	ND		ug/L	1.0	10/28/2021	AB21-1028-02
Arsenic	2		ug/L	1.0	10/28/2021	AB21-1028-02
Barium	102		ug/L	5.0	10/28/2021	AB21-1028-02
Beryllium	ND		ug/L	1.0	10/28/2021	AB21-1028-02
Boron	1530		ug/L	20.0	10/28/2021	AB21-1028-02
Cadmium	ND		ug/L	0.2	10/28/2021	AB21-1028-02
Calcium	73100		ug/L	1000.0	10/28/2021	AB21-1028-02
Chromium	1		ug/L	1.0	10/28/2021	AB21-1028-02
Cobalt	ND		ug/L	6.0	10/28/2021	AB21-1028-02
Copper	ND		ug/L	1.0	10/28/2021	AB21-1028-02
Iron	128		ug/L	20.0	10/28/2021	AB21-1028-02
Lead	ND		ug/L	1.0	10/28/2021	AB21-1028-02
Lithium	29		ug/L	10.0	10/28/2021	AB21-1028-02
Magnesium	16200		ug/L	1000.0	10/28/2021	AB21-1028-02
Molybdenum	ND		ug/L	5.0	10/28/2021	AB21-1028-02
Nickel	4		ug/L	2.0	10/28/2021	AB21-1028-02
Potassium	6020		ug/L	100.0	10/28/2021	AB21-1028-02
Selenium	3		ug/L	1.0	10/28/2021	AB21-1028-02
Silver	ND		ug/L	0.2	10/28/2021	AB21-1028-02
Sodium	110000		ug/L	1000.0	10/28/2021	AB21-1028-02
Thallium	ND		ug/L	2.0	10/28/2021	AB21-1028-02
Vanadium	ND		ug/L	2.0	10/28/2021	AB21-1028-02
Zinc	ND		ug/L	10.0	10/28/2021	AB21-1028-02

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

Aliquot #: 21-1168-01-C02-A01 Analyst: TMR

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Chloride	102000		ug/L	1000.0	10/12/2021	AB21-1012-05
Fluoride	ND		ug/L	1000.0	10/12/2021	AB21-1012-05
Sulfate	58300		ug/L	1000.0	10/12/2021	AB21-1012-05

Total Dissolved Solids by SM 2540C

Aliquot #: 21-1168-01-C03-A01 Analyst: CLH

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Total Dissolved Solids	599		mg/L	10.0	10/08/2021	AB21-1008-01



Analytical Report

Report Date: 10/31/21

Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **DEK Bottom Ash Pond**
Field Sample ID: **DEK-MW-15002**
Lab Sample ID: 21-1168-01
Matrix: Groundwater

Laboratory Project: **21-1168**
Collect Date: 10/04/2021
Collect Time: 01:37 PM

Alkalinity by SM 2320B

Aliquot #: 21-1168-01-C04-A01

Analyst: DLS

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Alkalinity Total	294000		ug/L	10000.0	10/15/2021	AB21-1015-20
Alkalinity Bicarbonate	294000		ug/L	10000.0	10/15/2021	AB21-1015-20
Alkalinity Carbonate	ND		ug/L	10000.0	10/15/2021	AB21-1015-20

Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **DEK Bottom Ash Pond**
 Field Sample ID: **DEK-MW-15004**
 Lab Sample ID: 21-1168-02
 Matrix: Groundwater

Laboratory Project: **21-1168**
 Collect Date: 10/04/2021
 Collect Time: 02:46 PM

Mercury by EPA 7470A, Total, Aqueous

Aliquot #: 21-1168-02-C01-A01 Analyst: CLH

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Mercury	ND		ug/L	0.2	10/14/2021	AB21-1014-03

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

Aliquot #: 21-1168-02-C01-A02 Analyst: EB

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Antimony	ND		ug/L	1.0	10/28/2021	AB21-1028-02
Arsenic	170		ug/L	1.0	10/28/2021	AB21-1028-02
Barium	102		ug/L	5.0	10/28/2021	AB21-1028-02
Beryllium	ND		ug/L	1.0	10/28/2021	AB21-1028-02
Boron	1120		ug/L	20.0	10/28/2021	AB21-1028-02
Cadmium	ND		ug/L	0.2	10/28/2021	AB21-1028-02
Calcium	65800		ug/L	1000.0	10/28/2021	AB21-1028-02
Chromium	ND		ug/L	1.0	10/28/2021	AB21-1028-02
Cobalt	ND		ug/L	6.0	10/28/2021	AB21-1028-02
Copper	ND		ug/L	1.0	10/28/2021	AB21-1028-02
Iron	2440		ug/L	20.0	10/28/2021	AB21-1028-02
Lead	ND		ug/L	1.0	10/28/2021	AB21-1028-02
Lithium	35		ug/L	10.0	10/28/2021	AB21-1028-02
Magnesium	12200		ug/L	1000.0	10/28/2021	AB21-1028-02
Molybdenum	9		ug/L	5.0	10/28/2021	AB21-1028-02
Nickel	3		ug/L	2.0	10/28/2021	AB21-1028-02
Potassium	4400		ug/L	100.0	10/28/2021	AB21-1028-02
Selenium	2		ug/L	1.0	10/28/2021	AB21-1028-02
Silver	ND		ug/L	0.2	10/28/2021	AB21-1028-02
Sodium	95500		ug/L	1000.0	10/28/2021	AB21-1028-02
Thallium	ND		ug/L	2.0	10/28/2021	AB21-1028-02
Vanadium	ND		ug/L	2.0	10/28/2021	AB21-1028-02
Zinc	ND		ug/L	10.0	10/28/2021	AB21-1028-02

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

Aliquot #: 21-1168-02-C02-A01 Analyst: TMR

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Chloride	64000		ug/L	1000.0	10/12/2021	AB21-1012-05
Fluoride	ND		ug/L	1000.0	10/12/2021	AB21-1012-05
Sulfate	143000		ug/L	1000.0	10/12/2021	AB21-1012-05

Total Dissolved Solids by SM 2540C

Aliquot #: 21-1168-02-C03-A01 Analyst: CLH

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Total Dissolved Solids	530		mg/L	10.0	10/08/2021	AB21-1008-01



Analytical Report

Report Date: 10/31/21

Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **DEK Bottom Ash Pond**
Field Sample ID: **DEK-MW-15004**
Lab Sample ID: 21-1168-02
Matrix: Groundwater

Laboratory Project: **21-1168**
Collect Date: 10/04/2021
Collect Time: 02:46 PM

Alkalinity by SM 2320B

Aliquot #: 21-1168-02-C04-A01

Analyst: DLS

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Alkalinity Total	154000		ug/L	10000.0	10/15/2021	AB21-1015-20
Alkalinity Bicarbonate	154000		ug/L	10000.0	10/15/2021	AB21-1015-20
Alkalinity Carbonate	ND		ug/L	10000.0	10/15/2021	AB21-1015-20

Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **DEK Bottom Ash Pond**
 Field Sample ID: **DEK-MW-15005**
 Lab Sample ID: 21-1168-03
 Matrix: Groundwater

Laboratory Project: **21-1168**
 Collect Date: 10/04/2021
 Collect Time: 11:39 AM

Mercury by EPA 7470A, Total, Aqueous

Aliquot #: 21-1168-03-C01-A01 Analyst: CLH

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Mercury	ND		ug/L	0.2	10/14/2021	AB21-1014-03

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

Aliquot #: 21-1168-03-C01-A02 Analyst: EB

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Antimony	ND		ug/L	1.0	10/28/2021	AB21-1028-02
Arsenic	68		ug/L	1.0	10/28/2021	AB21-1028-02
Barium	192		ug/L	5.0	10/28/2021	AB21-1028-02
Beryllium	ND		ug/L	1.0	10/28/2021	AB21-1028-02
Boron	991		ug/L	20.0	10/28/2021	AB21-1028-02
Cadmium	ND		ug/L	0.2	10/28/2021	AB21-1028-02
Calcium	102000		ug/L	1000.0	10/28/2021	AB21-1028-02
Chromium	ND		ug/L	1.0	10/28/2021	AB21-1028-02
Cobalt	ND		ug/L	6.0	10/28/2021	AB21-1028-02
Copper	ND		ug/L	1.0	10/28/2021	AB21-1028-02
Iron	916		ug/L	20.0	10/28/2021	AB21-1028-02
Lead	ND		ug/L	1.0	10/28/2021	AB21-1028-02
Lithium	41		ug/L	10.0	10/28/2021	AB21-1028-02
Magnesium	14700		ug/L	1000.0	10/28/2021	AB21-1028-02
Molybdenum	7		ug/L	5.0	10/28/2021	AB21-1028-02
Nickel	6		ug/L	2.0	10/28/2021	AB21-1028-02
Potassium	6290		ug/L	100.0	10/28/2021	AB21-1028-02
Selenium	2		ug/L	1.0	10/28/2021	AB21-1028-02
Silver	ND		ug/L	0.2	10/28/2021	AB21-1028-02
Sodium	81100		ug/L	1000.0	10/28/2021	AB21-1028-02
Thallium	ND		ug/L	2.0	10/28/2021	AB21-1028-02
Vanadium	ND		ug/L	2.0	10/28/2021	AB21-1028-02
Zinc	ND		ug/L	10.0	10/28/2021	AB21-1028-02

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

Aliquot #: 21-1168-03-C02-A01 Analyst: TMR

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Chloride	82300		ug/L	1000.0	10/12/2021	AB21-1012-05
Fluoride	ND		ug/L	1000.0	10/12/2021	AB21-1012-05
Sulfate	57200		ug/L	1000.0	10/12/2021	AB21-1012-05

Total Dissolved Solids by SM 2540C

Aliquot #: 21-1168-03-C03-A01 Analyst: CLH

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Total Dissolved Solids	546		mg/L	10.0	10/08/2021	AB21-1008-01



Analytical Report

Report Date: 10/31/21

Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **DEK Bottom Ash Pond**
Field Sample ID: **DEK-MW-15005**
Lab Sample ID: 21-1168-03
Matrix: Groundwater

Laboratory Project: **21-1168**
Collect Date: 10/04/2021
Collect Time: 11:39 AM

Alkalinity by SM 2320B

Aliquot #: 21-1168-03-C04-A01

Analyst: DLS

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Alkalinity Total	297000		ug/L	10000.0	10/15/2021	AB21-1015-20
Alkalinity Bicarbonate	297000		ug/L	10000.0	10/15/2021	AB21-1015-20
Alkalinity Carbonate	ND		ug/L	10000.0	10/15/2021	AB21-1015-20

Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **DEK Bottom Ash Pond**
 Field Sample ID: **DEK-MW-15006**
 Lab Sample ID: 21-1168-04
 Matrix: Groundwater

Laboratory Project: **21-1168**
 Collect Date: 10/04/2021
 Collect Time: 12:32 PM

Mercury by EPA 7470A, Total, Aqueous

Aliquot #: 21-1168-04-C01-A01 Analyst: CLH

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Mercury	ND		ug/L	0.2	10/14/2021	AB21-1014-03

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

Aliquot #: 21-1168-04-C01-A02 Analyst: EB

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Antimony	ND		ug/L	1.0	10/28/2021	AB21-1028-02
Arsenic	23		ug/L	1.0	10/28/2021	AB21-1028-02
Barium	125		ug/L	5.0	10/28/2021	AB21-1028-02
Beryllium	ND		ug/L	1.0	10/28/2021	AB21-1028-02
Boron	1050		ug/L	20.0	10/28/2021	AB21-1028-02
Cadmium	ND		ug/L	0.2	10/28/2021	AB21-1028-02
Calcium	117000		ug/L	1000.0	10/28/2021	AB21-1028-02
Chromium	ND		ug/L	1.0	10/28/2021	AB21-1028-02
Cobalt	ND		ug/L	6.0	10/28/2021	AB21-1028-02
Copper	ND		ug/L	1.0	10/28/2021	AB21-1028-02
Iron	1300		ug/L	20.0	10/28/2021	AB21-1028-02
Lead	ND		ug/L	1.0	10/28/2021	AB21-1028-02
Lithium	19		ug/L	10.0	10/28/2021	AB21-1028-02
Magnesium	13200		ug/L	1000.0	10/28/2021	AB21-1028-02
Molybdenum	7		ug/L	5.0	10/28/2021	AB21-1028-02
Nickel	11		ug/L	2.0	10/28/2021	AB21-1028-02
Potassium	8260		ug/L	100.0	10/28/2021	AB21-1028-02
Selenium	2		ug/L	1.0	10/28/2021	AB21-1028-02
Silver	ND		ug/L	0.2	10/28/2021	AB21-1028-02
Sodium	109000		ug/L	1000.0	10/28/2021	AB21-1028-02
Thallium	ND		ug/L	2.0	10/28/2021	AB21-1028-02
Vanadium	ND		ug/L	2.0	10/28/2021	AB21-1028-02
Zinc	ND		ug/L	10.0	10/28/2021	AB21-1028-02

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

Aliquot #: 21-1168-04-C02-A01 Analyst: TMR

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Chloride	78900		ug/L	1000.0	10/12/2021	AB21-1012-05
Fluoride	ND		ug/L	1000.0	10/12/2021	AB21-1012-05
Sulfate	209000		ug/L	1000.0	10/12/2021	AB21-1012-05

Total Dissolved Solids by SM 2540C

Aliquot #: 21-1168-04-C03-A01 Analyst: CLH

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Total Dissolved Solids	712		mg/L	10.0	10/08/2021	AB21-1008-01



Analytical Report

Report Date: 10/31/21

Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **DEK Bottom Ash Pond**
Field Sample ID: **DEK-MW-15006**
Lab Sample ID: 21-1168-04
Matrix: Groundwater

Laboratory Project: **21-1168**
Collect Date: 10/04/2021
Collect Time: 12:32 PM

Alkalinity by SM 2320B

Aliquot #: 21-1168-04-C04-A01

Analyst: DLS

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Alkalinity Total	239000		ug/L	10000.0	10/15/2021	AB21-1015-20
Alkalinity Bicarbonate	239000		ug/L	10000.0	10/15/2021	AB21-1015-20
Alkalinity Carbonate	ND		ug/L	10000.0	10/15/2021	AB21-1015-20

Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **DEK Bottom Ash Pond**
 Field Sample ID: **DUP-DEK-BAP**
 Lab Sample ID: 21-1168-05
 Matrix: Groundwater

Laboratory Project: **21-1168**
 Collect Date: 10/04/2021
 Collect Time: 12:00 PM

Mercury by EPA 7470A, Total, Aqueous

Aliquot #: 21-1168-05-C01-A01 Analyst: CLH

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Mercury	ND		ug/L	0.2	10/14/2021	AB21-1014-03

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

Aliquot #: 21-1168-05-C01-A02 Analyst: EB

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Antimony	ND		ug/L	1.0	10/28/2021	AB21-1028-02
Arsenic	24		ug/L	1.0	10/28/2021	AB21-1028-02
Barium	126		ug/L	5.0	10/28/2021	AB21-1028-02
Beryllium	ND		ug/L	1.0	10/28/2021	AB21-1028-02
Boron	1080		ug/L	20.0	10/28/2021	AB21-1028-02
Cadmium	ND		ug/L	0.2	10/28/2021	AB21-1028-02
Calcium	117000		ug/L	1000.0	10/28/2021	AB21-1028-02
Chromium	ND		ug/L	1.0	10/28/2021	AB21-1028-02
Cobalt	ND		ug/L	6.0	10/28/2021	AB21-1028-02
Copper	ND		ug/L	1.0	10/28/2021	AB21-1028-02
Iron	1430		ug/L	20.0	10/28/2021	AB21-1028-02
Lead	ND		ug/L	1.0	10/28/2021	AB21-1028-02
Lithium	19		ug/L	10.0	10/28/2021	AB21-1028-02
Magnesium	13400		ug/L	1000.0	10/28/2021	AB21-1028-02
Molybdenum	7		ug/L	5.0	10/28/2021	AB21-1028-02
Nickel	11		ug/L	2.0	10/28/2021	AB21-1028-02
Potassium	8190		ug/L	100.0	10/28/2021	AB21-1028-02
Selenium	2		ug/L	1.0	10/28/2021	AB21-1028-02
Silver	ND		ug/L	0.2	10/28/2021	AB21-1028-02
Sodium	109000		ug/L	1000.0	10/28/2021	AB21-1028-02
Thallium	ND		ug/L	2.0	10/28/2021	AB21-1028-02
Vanadium	ND		ug/L	2.0	10/28/2021	AB21-1028-02
Zinc	ND		ug/L	10.0	10/28/2021	AB21-1028-02

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

Aliquot #: 21-1168-05-C02-A01 Analyst: TMR

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Chloride	74700		ug/L	1000.0	10/12/2021	AB21-1012-05
Fluoride	ND		ug/L	1000.0	10/12/2021	AB21-1012-05
Sulfate	196000		ug/L	1000.0	10/12/2021	AB21-1012-05

Total Dissolved Solids by SM 2540C

Aliquot #: 21-1168-05-C03-A01 Analyst: CLH

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Total Dissolved Solids	708		mg/L	10.0	10/08/2021	AB21-1008-01



Analytical Report

Report Date: 10/31/21
11/17/21R

Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **DEK Bottom Ash Pond**
Field Sample ID: **DUP-DEK-BAP**
Lab Sample ID: 21-1168-05
Matrix: Groundwater

Laboratory Project: **21-1168**
Collect Date: 10/04/2021
Collect Time: 12:00 PM

Alkalinity by SM 2320B

Aliquot #: 21-1168-05-C04-A01

Analyst: DLS

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Alkalinity Total	239000		ug/L	10000.0	10/15/2021	AB21-1015-20
Alkalinity Bicarbonate	239000		ug/L	10000.0	10/15/2021	AB21-1015-20
Alkalinity Carbonate	ND		ug/L	10000.0	10/15/2021	AB21-1015-20

Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **DEK Bottom Ash Pond**
 Field Sample ID: **FB-DEK-BAP**
 Lab Sample ID: 21-1168-06
 Matrix: Water

Laboratory Project: **21-1168**
 Collect Date: 10/04/2021
 Collect Time: 01:37 PM

Mercury by EPA 7470A, Total, Aqueous

Aliquot #: 21-1168-06-C01-A01

Analyst: CLH

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Mercury	ND		ug/L	0.2	10/14/2021	AB21-1014-03

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

Aliquot #: 21-1168-06-C01-A02

Analyst: EB

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Antimony	ND		ug/L	1.0	10/28/2021	AB21-1028-02
Arsenic	ND		ug/L	1.0	10/28/2021	AB21-1028-02
Barium	ND		ug/L	5.0	10/28/2021	AB21-1028-02
Beryllium	ND		ug/L	1.0	10/28/2021	AB21-1028-02
Boron	ND		ug/L	20.0	10/28/2021	AB21-1028-02
Cadmium	ND		ug/L	0.2	10/28/2021	AB21-1028-02
Calcium	ND		ug/L	1000.0	10/28/2021	AB21-1028-02
Chromium	ND		ug/L	1.0	10/28/2021	AB21-1028-02
Cobalt	ND		ug/L	6.0	10/28/2021	AB21-1028-02
Copper	ND		ug/L	1.0	10/28/2021	AB21-1028-02
Iron	ND		ug/L	20.0	10/28/2021	AB21-1028-02
Lead	ND		ug/L	1.0	10/28/2021	AB21-1028-02
Lithium	ND		ug/L	10.0	10/28/2021	AB21-1028-02
Magnesium	ND		ug/L	1000.0	10/28/2021	AB21-1028-02
Molybdenum	ND		ug/L	5.0	10/28/2021	AB21-1028-02
Nickel	ND		ug/L	2.0	10/28/2021	AB21-1028-02
Potassium	ND		ug/L	100.0	10/28/2021	AB21-1028-02
Selenium	ND		ug/L	1.0	10/28/2021	AB21-1028-02
Silver	ND		ug/L	0.2	10/28/2021	AB21-1028-02
Sodium	ND		ug/L	1000.0	10/28/2021	AB21-1028-02
Thallium	ND		ug/L	2.0	10/28/2021	AB21-1028-02
Vanadium	ND		ug/L	2.0	10/28/2021	AB21-1028-02
Zinc	ND		ug/L	10.0	10/28/2021	AB21-1028-02

Data Qualifiers	Exception Summary
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No exceptions occurred.

CONSUMERS
ENERGY

Chemistry Department
General Standard Operating Procedure

PROC CHEM-1.2.01
PAGE 1 OF 2
REVISION 3
ATTACHMENT A

TITLE: SAMPLE LOG-IN – SHIPMENT INSPECTION FORM

Project Log-In Number: 21-1168

Inspection Date: 10.7.21 Inspection By: dms

Sample Origin/Project Name: _____

Shipment Delivered By: Enter the type of shipment carrier.

Pony _____ FedEx UPS _____ USPS _____ Airborne _____

Other/Hand Carry (whom) _____

Tracking Number: 28460083 3513 Shipping Form Attached: Yes No _____

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

Cooler Cardboard Box _____ Custom Case _____ Envelope/Mailer _____

Loose/Unpackaged Containers _____ Other _____

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

Damaged Shipment Observed: None Dented _____ Leaking _____

Other _____

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

Shipping Containers Received: Opened _____ Sealed

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

CoC Work Request _____ Air Data Sheet _____ Other _____

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

As-Received Temperature Range 1.6-3.1°C Samples Received on Ice: Yes No _____

M&TE # and Expiration 015402 6.3.22

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

Container Type	Water	Soil	Other	Broken	Leaking
VOA (40mL or 60mL)	<u>10</u>	_____	_____	_____	_____
Quart/Liter (g/p)	_____	_____	_____	_____	_____
9-oz (amber glass jar)	_____	_____	_____	_____	_____
2-oz (amber glass)	_____	_____	_____	_____	_____
125 mL (plastic)	<u>9</u>	_____	_____	_____	_____
24 mL vial (glass)	_____	_____	_____	_____	_____
500 mL (plastic)	_____	_____	_____	_____	_____
Other <u>250 ml plastic</u>	<u>5</u>	_____	_____	_____	_____

pH paper
fisher sci
0.0-3.0
cat no. 13-640-511
lot: 230418
Exp: 10.30.21

CHAIN OF CUSTODY

CONSUMERS ENERGY COMPANY – LABORATORY SERVICES



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

SAMPLING SITE: DEK Bottom Ash Pond – 2021 Q4				PROJECT NUMBER: 21-1168			ANALYSIS REQUESTED								Page 1 of 1		
SAMPLING TEAM:				DATE SHIPPED:		SITE SKETCHED ATTACHED? CIRCLE ONE: YES NO		Total Metals	Anions	TDS	Alkalinity						SEND REPORT TO: CDBatts
PHONE: _____																	
CE CONTROL #	SAMPLE DATE	SAMPLE TIME	SAMPLE MATRIX	SAMPLE DESCRIPTION / LOCATION	DEPTH (ft)	# OF CONTAINERS											REMARKS
21-1168-01	10-4-21	1337	GW	DEK-MW-15002		5	X	X	X	X							
-02	10-4-21	1446	GW	DEK-MW-15004		5	X	X	X	X							
-03	10-4-21	1139	GW	DEK-MW-15005		5	X	X	X	X							
-04	10-4-21	1232	GW	DEK-MW-15006		5	X	X	X	X							
-05	10-4-21	—	W	DUP-DEK-BAP		5	X	X	X	X							
▼ -06	10-4-21	1337	W	FB-DEK-BAP		1	X										
RELINQUISHED BY: (SIGNATURE) <i>[Signature]</i>				DATE/TIME 10-6-21 / 11:15		RECEIVED BY: (SIGNATURE) <i>Fedex</i>		COMMENTS									
RELINQUISHED BY: (SIGNATURE) <i>FedEx</i>				DATE/TIME: 10-07-21 11:30		RECEIVED BY: (SIGNATURE) <i>[Signature]</i>											

ORIGINAL TO LAB COPY TO CUSTOMER

To: CDBatts, Karn/Weadock

From: EBlaj, T-258

Date: October 31, 2021

Subject: RCRA GROUNDWATER MONITORING – KARN BAP & LINED IMP. WELLS – 2021 Q4

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

Darby Litz, Project Manager
TRC Companies, Inc.
1540 Eisenhower Place
Ann Arbor, MI 48108

Chemistry Project: 21-1169

TRC Environmental, Inc. conducted groundwater monitoring at the DEKarn Bottom Ash Pond and Lined Impoundment Wells area on 10/07/2021, for the 4th Quarter monitoring requirement, as specified in the Sampling and Analysis Plan for the site. The samples were received for analysis by the Chemistry department of Laboratory Services on 10/07/2021.

The report that follows presents the results of the requested analytical testing; the results apply only to the samples as received. All samples have been analyzed in accordance with the 2016 TNI Standard and the applicable A2LA accreditation scope for Laboratory Services. Any exceptions to applicable test method criteria and standard compliance are noted in the Case Narrative, or flagged with applicable qualifiers in the analytical results section.

Reviewed and approved by:

Emil Blaj
Sr. Technical Analyst
Project Lead



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

CASE NARRATIVE

I. Sample Receipt

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

II. Methodology

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

III. Results/Quality Control

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

DEFINITIONS / QUALIFIERS

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

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

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

Work Order Sample Summary

Customer Name: Karn/Weadock Complex

Work Order ID: Q4-2021 DEK RCRA Bottom Ash Pond & Lined Impoundment

Date Received: 10/7/2021

Chemistry Project: 21-1169

<u>Sample #</u>	<u>Field Sample ID</u>	<u>Matrix</u>	<u>Sample Date</u>	<u>Site</u>
21-1169-01	DEK-MW-15003	Groundwater	10/07/2021 07:27 AM	DEK Bottom Ash Pond & Lined Impoundment
21-1169-02	DEK-MW-18001	Groundwater	10/07/2021 06:32 AM	DEK Bottom Ash Pond & Lined Impoundment
21-1169-03	DEK-MW-18001 MS	Groundwater	10/07/2021 06:32 AM	DEK Bottom Ash Pond & Lined Impoundment
21-1169-04	DEK-MW-18001 MSD	Groundwater	10/07/2021 06:32 AM	DEK Bottom Ash Pond & Lined Impoundment



Analytical Report

Report Date: 10/31/21

Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **DEK Bottom Ash Pond & Lined Impoundment**
Field Sample ID: **DEK-MW-15003**
Lab Sample ID: 21-1169-01
Matrix: Groundwater

Laboratory Project: **21-1169**
Collect Date: 10/07/2021
Collect Time: 07:27 AM

Mercury by EPA 7470A, Total, Aqueous

Aliquot #: 21-1169-01-C01-A01

Analyst: CLH

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Mercury	ND		ug/L	0.2	10/14/2021	AB21-1014-03

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

Aliquot #: 21-1169-01-C01-A02

Analyst: EB

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Antimony	ND		ug/L	1.0	10/28/2021	AB21-1028-02
Arsenic	481		ug/L	1.0	10/28/2021	AB21-1028-02
Barium	42		ug/L	5.0	10/28/2021	AB21-1028-02
Beryllium	ND		ug/L	1.0	10/28/2021	AB21-1028-02
Boron	976		ug/L	20.0	10/28/2021	AB21-1028-02
Cadmium	ND		ug/L	0.2	10/28/2021	AB21-1028-02
Calcium	24500		ug/L	1000.0	10/28/2021	AB21-1028-02
Chromium	ND		ug/L	1.0	10/28/2021	AB21-1028-02
Cobalt	ND		ug/L	6.0	10/28/2021	AB21-1028-02
Copper	ND		ug/L	1.0	10/28/2021	AB21-1028-02
Iron	103		ug/L	20.0	10/28/2021	AB21-1028-02
Lead	ND		ug/L	1.0	10/28/2021	AB21-1028-02
Lithium	19		ug/L	10.0	10/28/2021	AB21-1028-02
Magnesium	3970		ug/L	1000.0	10/28/2021	AB21-1028-02
Molybdenum	28		ug/L	5.0	10/28/2021	AB21-1028-02
Nickel	ND		ug/L	2.0	10/28/2021	AB21-1028-02
Potassium	4520		ug/L	100.0	10/28/2021	AB21-1028-02
Selenium	1		ug/L	1.0	10/28/2021	AB21-1028-02
Silver	ND		ug/L	0.2	10/28/2021	AB21-1028-02
Sodium	50100		ug/L	1000.0	10/28/2021	AB21-1028-02
Thallium	ND		ug/L	2.0	10/28/2021	AB21-1028-02
Vanadium	ND		ug/L	2.0	10/28/2021	AB21-1028-02
Zinc	ND		ug/L	10.0	10/28/2021	AB21-1028-02

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

Aliquot #: 21-1169-01-C02-A01

Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Chloride	54000		ug/L	1000.0	10/14/2021	AB21-1014-08
Fluoride	ND		ug/L	1000.0	10/14/2021	AB21-1014-08
Sulfate	39700		ug/L	1000.0	10/14/2021	AB21-1014-08

Total Dissolved Solids by SM 2540C

Aliquot #: 21-1169-01-C03-A01

Analyst: CLH

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Total Dissolved Solids	253		mg/L	10.0	10/11/2021	AB21-1011-04



Analytical Report

Report Date: 10/31/21

Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **DEK Bottom Ash Pond & Lined Impoundment**
Field Sample ID: **DEK-MW-15003**
Lab Sample ID: 21-1169-01
Matrix: Groundwater

Laboratory Project: **21-1169**
Collect Date: 10/07/2021
Collect Time: 07:27 AM

Alkalinity by SM 2320B

Aliquot #: 21-1169-01-C04-A01

Analyst: DLS

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Alkalinity Total	65200		ug/L	10000.0	10/14/2021	AB21-1014-10
Alkalinity Bicarbonate	65200		ug/L	10000.0	10/14/2021	AB21-1014-10
Alkalinity Carbonate	ND		ug/L	10000.0	10/14/2021	AB21-1014-10



Analytical Report

Report Date: 10/31/21

Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **DEK Bottom Ash Pond & Lined Impoundment**
 Field Sample ID: **DEK-MW-18001**
 Lab Sample ID: 21-1169-02
 Matrix: Groundwater

Laboratory Project: **21-1169**
 Collect Date: 10/07/2021
 Collect Time: 06:32 AM

Mercury by EPA 7470A, Total, Aqueous

Aliquot #: 21-1169-02-C01-A01

Analyst: CLH

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Mercury	ND		ug/L	0.2	10/14/2021	AB21-1014-03

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

Aliquot #: 21-1169-02-C01-A02

Analyst: EB

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Antimony	ND		ug/L	1.0	10/28/2021	AB21-1028-02
Arsenic	85		ug/L	1.0	10/28/2021	AB21-1028-02
Barium	135		ug/L	5.0	10/28/2021	AB21-1028-02
Beryllium	ND		ug/L	1.0	10/28/2021	AB21-1028-02
Boron	1370		ug/L	20.0	10/28/2021	AB21-1028-02
Cadmium	ND		ug/L	0.2	10/28/2021	AB21-1028-02
Calcium	71000		ug/L	1000.0	10/28/2021	AB21-1028-02
Chromium	ND		ug/L	1.0	10/28/2021	AB21-1028-02
Cobalt	ND		ug/L	6.0	10/28/2021	AB21-1028-02
Copper	ND		ug/L	1.0	10/28/2021	AB21-1028-02
Iron	1190		ug/L	20.0	10/28/2021	AB21-1028-02
Lead	ND		ug/L	1.0	10/28/2021	AB21-1028-02
Lithium	24		ug/L	10.0	10/28/2021	AB21-1028-02
Magnesium	12600		ug/L	1000.0	10/28/2021	AB21-1028-02
Molybdenum	ND		ug/L	5.0	10/28/2021	AB21-1028-02
Nickel	4		ug/L	2.0	10/28/2021	AB21-1028-02
Potassium	3540		ug/L	100.0	10/28/2021	AB21-1028-02
Selenium	2		ug/L	1.0	10/28/2021	AB21-1028-02
Silver	ND		ug/L	0.2	10/28/2021	AB21-1028-02
Sodium	79300		ug/L	1000.0	10/28/2021	AB21-1028-02
Thallium	ND		ug/L	2.0	10/28/2021	AB21-1028-02
Vanadium	ND		ug/L	2.0	10/28/2021	AB21-1028-02
Zinc	ND		ug/L	10.0	10/28/2021	AB21-1028-02

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

Aliquot #: 21-1169-02-C02-A01

Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Chloride	55200		ug/L	1000.0	10/14/2021	AB21-1014-08
Fluoride	ND		ug/L	1000.0	10/14/2021	AB21-1014-08
Sulfate	118000		ug/L	1000.0	10/14/2021	AB21-1014-08

Total Dissolved Solids by SM 2540C

Aliquot #: 21-1169-02-C03-A01

Analyst: CLH

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Total Dissolved Solids	494		mg/L	10.0	10/11/2021	AB21-1011-04



Analytical Report

Report Date: 10/31/21

Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **DEK Bottom Ash Pond & Lined Impoundment**
Field Sample ID: **DEK-MW-18001**
Lab Sample ID: 21-1169-02
Matrix: Groundwater

Laboratory Project: **21-1169**
Collect Date: 10/07/2021
Collect Time: 06:32 AM

Alkalinity by SM 2320B

Aliquot #: 21-1169-02-C04-A01

Analyst: DLS

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Alkalinity Total	192000		ug/L	10000.0	10/14/2021	AB21-1014-10
Alkalinity Bicarbonate	192000		ug/L	10000.0	10/14/2021	AB21-1014-10
Alkalinity Carbonate	ND		ug/L	10000.0	10/14/2021	AB21-1014-10



Analytical Report

Report Date: 10/31/21

Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **DEK Bottom Ash Pond & Lined Impoundment**
Field Sample ID: **DEK-MW-18001 MS**
Lab Sample ID: 21-1169-03
Matrix: Groundwater

Laboratory Project: **21-1169**
Collect Date: 10/07/2021
Collect Time: 06:32 AM

Mercury by EPA 7470A, Total, Aqueous

Aliquot #: 21-1169-03-C01-A01

Analyst: CLH

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Mercury	98.2		%	0.2	10/14/2021	AB21-1014-03

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

Aliquot #: 21-1169-03-C01-A02

Analyst: EB

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Antimony	103		%	1.0	10/28/2021	AB21-1028-02
Arsenic	95		%	1.0	10/28/2021	AB21-1028-02
Barium	113		%	5.0	10/28/2021	AB21-1028-02
Beryllium	102		%	1.0	10/28/2021	AB21-1028-02
Boron	111		%	20.0	10/28/2021	AB21-1028-02
Cadmium	102		%	0.2	10/28/2021	AB21-1028-02
Calcium	113		%	1000.0	10/28/2021	AB21-1028-02
Chromium	105		%	1.0	10/28/2021	AB21-1028-02
Cobalt	105		%	6.0	10/28/2021	AB21-1028-02
Copper	98		%	1.0	10/28/2021	AB21-1028-02
Iron	113		%	20.0	10/28/2021	AB21-1028-02
Lead	82		%	1.0	10/28/2021	AB21-1028-02
Lithium	102		%	10.0	10/28/2021	AB21-1028-02
Magnesium	112		%	1000.0	10/28/2021	AB21-1028-02
Molybdenum	92		%	5.0	10/28/2021	AB21-1028-02
Nickel	101		%	2.0	10/28/2021	AB21-1028-02
Potassium	105		%	100.0	10/28/2021	AB21-1028-02
Selenium	91		%	1.0	10/28/2021	AB21-1028-02
Silver	88.6		%	0.2	10/28/2021	AB21-1028-02
Sodium	108		%	1000.0	10/28/2021	AB21-1028-02
Thallium	87		%	2.0	10/28/2021	AB21-1028-02
Vanadium	86		%	2.0	10/28/2021	AB21-1028-02
Zinc	110		%	10.0	10/28/2021	AB21-1028-02

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

Aliquot #: 21-1169-03-C02-A01

Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Chloride	106		%	1000.0	10/14/2021	AB21-1014-08
Fluoride	92		%	1000.0	10/14/2021	AB21-1014-08
Sulfate	105		%	1000.0	10/14/2021	AB21-1014-08

Alkalinity by SM 2320B

Aliquot #: 21-1169-03-C03-A01

Analyst: DLS

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Alkalinity Total	98.0		%	10000.0	10/14/2021	AB21-1014-10



Analytical Report

Report Date: 10/31/21

Laboratory Services

A CENTURY OF EXCELLENCE

Sample Site: **DEK Bottom Ash Pond & Lined Impoundment**
Field Sample ID: **DEK-MW-18001 MSD**
Lab Sample ID: 21-1169-04
Matrix: Groundwater

Laboratory Project: **21-1169**
Collect Date: 10/07/2021
Collect Time: 06:32 AM

Mercury by EPA 7470A, Total, Aqueous

Aliquot #: 21-1169-04-C01-A01

Analyst: CLH

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Mercury	110		%	0.2	10/14/2021	AB21-1014-03

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

Aliquot #: 21-1169-04-C01-A02

Analyst: EB

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Antimony	103		%	1.0	10/28/2021	AB21-1028-02
Arsenic	86		%	1.0	10/28/2021	AB21-1028-02
Barium	96		%	5.0	10/28/2021	AB21-1028-02
Beryllium	105		%	1.0	10/28/2021	AB21-1028-02
Boron	112		%	20.0	10/28/2021	AB21-1028-02
Cadmium	99.7		%	0.2	10/28/2021	AB21-1028-02
Calcium	111		%	1000.0	10/28/2021	AB21-1028-02
Chromium	107		%	1.0	10/28/2021	AB21-1028-02
Cobalt	103		%	6.0	10/28/2021	AB21-1028-02
Copper	99		%	1.0	10/28/2021	AB21-1028-02
Iron	103		%	20.0	10/28/2021	AB21-1028-02
Lead	81		%	1.0	10/28/2021	AB21-1028-02
Lithium	103		%	10.0	10/28/2021	AB21-1028-02
Magnesium	116		%	1000.0	10/28/2021	AB21-1028-02
Molybdenum	94		%	5.0	10/28/2021	AB21-1028-02
Nickel	103		%	2.0	10/28/2021	AB21-1028-02
Potassium	107		%	100.0	10/28/2021	AB21-1028-02
Selenium	94		%	1.0	10/28/2021	AB21-1028-02
Silver	85.5		%	0.2	10/28/2021	AB21-1028-02
Sodium	110		%	1000.0	10/28/2021	AB21-1028-02
Thallium	85		%	2.0	10/28/2021	AB21-1028-02
Vanadium	87		%	2.0	10/28/2021	AB21-1028-02
Zinc	109		%	10.0	10/28/2021	AB21-1028-02

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

Aliquot #: 21-1169-04-C02-A01

Analyst: DMW

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Chloride	106		%	1000.0	10/14/2021	AB21-1014-08
Fluoride	92		%	1000.0	10/14/2021	AB21-1014-08
Sulfate	103		%	1000.0	10/14/2021	AB21-1014-08

Alkalinity by SM 2320B

Aliquot #: 21-1169-04-C03-A01

Analyst: DLS

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Alkalinity Total	97.5		%	10000.0	10/14/2021	AB21-1014-10



Analytical Report

Report Date: 10/31/21

Laboratory Services
A CENTURY OF EXCELLENCE

Data Qualifiers	Exception Summary
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No exceptions occurred.

CONSUMERS
ENERGY

Chemistry Department
General Standard Operating Procedure

PROC CHEM-1 2.01
PAGE 1 OF 2
REVISION 3
ATTACHMENT A

TITLE: SAMPLE LOG-IN – SHIPMENT INSPECTION FORM

Project Log-In Number: 21-1169
Inspection Date: 10/9/21 Inspection By: CWH
Sample Origin/Project Name: DEK BAP + LI

Shipment Delivered By: Enter the type of shipment carrier

Pony _____ FedEx _____ UPS _____ USPS _____ Airborne _____
Other/Hand Carry (whom) TRC
Tracking Number: _____ Shipping Form Attached. Yes _____ No _____

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

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

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

Damaged Shipment Observed. None _____ Dented _____ Leaking _____
Other _____

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

Shipping Containers Received Opened _____ Sealed _____

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

CoC _____ Work Request _____ Air Data Sheet _____ Other _____

Temperature of Containers: Measure the temperature of several sample containers

As-Received Temperature Range 2.4 - 5.3°C Samples Received on Ice: Yes No _____

M&TE # and Expiration 015402 / 6-3-22

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

Container Type	Water	Soil	Other	Broken	Leaking
VOA (40mL or <u>60mL</u>)	<u>8</u>	_____	_____	_____	_____
Quart/Liter (g/p)	_____	_____	_____	_____	_____
9-oz (amber glass jar)	_____	_____	_____	_____	_____
2-oz (amber glass)	_____	_____	_____	_____	_____
125 mL (plastic)	<u>8</u>	_____	_____	_____	_____
24 mL vial (glass)	_____	_____	_____	_____	_____
<u>250</u> 500 mL (plastic)	<u>2</u>	_____	_____	_____	_____
Other _____	_____	_____	_____	_____	_____

PG. 292 not needed

CHAIN OF CUSTODY



CONSUMERS ENERGY COMPANY – LABORATORY SERVICES

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

SAMPLING SITE				PROJECT NUMBER			ANALYSIS REQUESTED							Page 1 of 1		
DEK Bottom Ash Pond & LI – 2021 Q4				21-1169			Total Metals	Anions	TDS	Alkalinity					SEND REPORT TO CDBatts	
SAMPLING TEAM				DATE SHIPPED		SITE SKETCHED ATTACHED? CIRCLE ONE									HD Register, TRC	
						YES NO									PHONE _____	
CE CONTROL #	SAMPLE DATE	SAMPLE TIME	SAMPLE MATRIX	SAMPLE DESCRIPTION / LOCATION	DEPTH (ft)	# OF CONTAINERS								REMARKS		
21-1169-01	10/7/11	0737	GW	DEK-MW-15003		5	X	X	X	X						
-02	11 1'	0630	GW	DEK-MW-18001		5	X	X	X	X						
-03	11 1'	0630	GW	DEK-MW-18001 MS		5	X	X		X						
-04	11 1'	0630	GW	DEK-MW-18001 MSD		5	X	X		X						

RELINQUISHED BY (SIGNATURE)	DATE/TIME	RECEIVED BY (SIGNATURE)	COMMENTS
	10/7/11 1530		2.4°c - 5.3°c #015402
RELINQUISHED BY (SIGNATURE)	DATE/TIME	RECEIVED BY (SIGNATURE)	
			ORIGINAL TO LAB COPY TO CUSTOMER

ANALYTICAL REPORT

Eurofins TestAmerica, Canton
4101 Shuffel Street NW
North Canton, OH 44720
Tel: (330)497-9396

Laboratory Job ID: 240-157750-1

Client Project/Site: Karn/Weadock CCR Background Wells

For:

TRC Environmental Corporation.
1540 Eisenhower Place
Ann Arbor, Michigan 48108-7080

Attn: Darby Litz



Authorized for release by:
11/19/2021 8:10:30 PM

Kris Brooks, Project Manager II
(330)966-9790
Kris.Brooks@Eurofinset.com

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

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



Table of Contents

Cover Page	1
Table of Contents	2
Definitions/Glossary	3
Case Narrative	4
Method Summary	5
Sample Summary	6
Client Sample Results	7
Tracer Carrier Summary	13
QC Sample Results	14
QC Association Summary	16
Lab Chronicle	17
Certification Summary	19
Chain of Custody	20
Receipt Checklists	25

Definitions/Glossary

Client: TRC Environmental Corporation.
Project/Site: Karn/Weadock CCR Background Wells

Job ID: 240-157750-1

Qualifiers

Rad

Qualifier	Qualifier Description
*	LCS or LCSD is outside acceptance limits.
U	Result is less than the sample detection limit.

Glossary

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

Case Narrative

Client: TRC Environmental Corporation.
Project/Site: Karn/Weadock CCR Background Wells

Job ID: 240-157750-1

Job ID: 240-157750-1

Laboratory: Eurofins TestAmerica, Canton

Narrative

Job Narrative 240-157750-1

Comments

The EPA Method 903.0 Radium-226, EPA Method 904.0 Radium-228, and Ra226_Ra228 Combined Radium 226 and Radium 228 analyses were performed at the Eurofins TestAmerica St. Louis laboratory.

Receipt

The samples were received on 10/9/2021 10:10 AM. Unless otherwise noted below, the samples arrived in good condition, and where required, properly preserved and on ice. The temperatures of the 3 coolers at receipt time were 1.9° C, 2.5° C and 3.1° C.

RAD

Method 903.0: Radium 226 batch 531995

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

Radiochemistry sample results are reported with the count date/time applied as the Activity Reference Date. MW-15002 (240-157750-1), MW-15008 (240-157750-2), MW-15016 (240-157750-3), MW-15019 (240-157750-4), DUP-04 (240-157750-5), EB-04 (240-157750-6), (LCS 160-531995/1-A), (LCSD 160-531995/2-A) and (MB 160-531995/20-A)

Method 904.0: Radium 228 batch 531998

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

Radiochemistry sample results are reported with the count date/time applied as the Activity Reference Date. MW-15002 (240-157750-1), MW-15008 (240-157750-2), MW-15016 (240-157750-3), MW-15019 (240-157750-4), DUP-04 (240-157750-5), EB-04 (240-157750-6), (LCS 160-531998/1-A), (LCSD 160-531998/2-A) and (MB 160-531998/20-A)

Method PrecSep_0: Radium-228 Prep Batch 160-531998

The following samples were prepared at a reduced aliquot due to Matrix: MW-15002 (240-157750-1), MW-15008 (240-157750-2), MW-15016 (240-157750-3), MW-15019 (240-157750-4) and DUP-04 (240-157750-5). A laboratory control sample/ laboratory control sample duplicate (LCS/LCSD) were prepared instead of a sample duplicate (DUP) to demonstrate batch precision.

Method PrecSep STD: 160-531995

The following samples were prepared at a reduced aliquot due to Matrix: MW-15002 (240-157750-1), MW-15008 (240-157750-2), MW-15016 (240-157750-3), MW-15019 (240-157750-4) and DUP-04 (240-157750-5). As a result a laboratory control sample/ laboratory control sample duplicate (LCS/LCSD) were prepared instead of a sample duplicate (DUP) to demonstrate batch precision. MW-15002 (240-157750-1), MW-15008 (240-157750-2), MW-15016 (240-157750-3), MW-15019 (240-157750-4) and DUP-04 (240-157750-5)

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

Method Summary

Client: TRC Environmental Corporation.
Project/Site: Karn/Weadock CCR Background Wells

Job ID: 240-157750-1

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

Protocol References:

EPA = US Environmental Protection Agency

None = None

TAL-STL = TestAmerica Laboratories, St. Louis, Facility Standard Operating Procedure.

Laboratory References:

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

Sample Summary

Client: TRC Environmental Corporation.
Project/Site: Karn/Weadock CCR Background Wells

Job ID: 240-157750-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
240-157750-1	MW-15002	Water	10/07/21 09:08	10/09/21 10:10
240-157750-2	MW-15008	Water	10/06/21 16:02	10/09/21 10:10
240-157750-3	MW-15016	Water	10/07/21 10:10	10/09/21 10:10
240-157750-4	MW-15019	Water	10/07/21 08:10	10/09/21 10:10
240-157750-5	DUP-04	Water	10/07/21 00:00	10/09/21 10:10
240-157750-6	EB-04	Water	10/07/21 10:10	10/09/21 10:10

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10
- 11
- 12
- 13
- 14

Client Sample Results

Client: TRC Environmental Corporation.
 Project/Site: Karn/Weadock CCR Background Wells

Job ID: 240-157750-1

Client Sample ID: MW-15002

Lab Sample ID: 240-157750-1

Date Collected: 10/07/21 09:08

Matrix: Water

Date Received: 10/09/21 10:10

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.775		0.361	0.367	1.00	0.415	pCi/L	10/15/21 11:10	11/08/21 17:29	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	96.1		40 - 110					10/15/21 11:10	11/08/21 17:29	1

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.225	U	0.347	0.347	1.00	0.582	pCi/L	10/15/21 11:44	11/08/21 13:12	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	96.1		40 - 110					10/15/21 11:44	11/08/21 13:12	1
Y Carrier	81.5		40 - 110					10/15/21 11:44	11/08/21 13:12	1

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

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	1.00		0.501	0.505	5.00	0.582	pCi/L		11/18/21 22:40	1

Client Sample Results

Client: TRC Environmental Corporation.
 Project/Site: Karn/Weadock CCR Background Wells

Job ID: 240-157750-1

Client Sample ID: MW-15008

Lab Sample ID: 240-157750-2

Date Collected: 10/06/21 16:02

Matrix: Water

Date Received: 10/09/21 10:10

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	1.05		0.410	0.421	1.00	0.455	pCi/L	10/15/21 11:10	11/08/21 17:29	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	102		40 - 110					10/15/21 11:10	11/08/21 17:29	1

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	1.11	*	0.371	0.385	1.00	0.493	pCi/L	10/15/21 11:44	11/08/21 13:12	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	102		40 - 110					10/15/21 11:44	11/08/21 13:12	1
Y Carrier	80.4		40 - 110					10/15/21 11:44	11/08/21 13:12	1

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

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	2.16		0.553	0.570	5.00	0.493	pCi/L		11/18/21 22:40	1

Client Sample Results

Client: TRC Environmental Corporation.
 Project/Site: Karn/Weadock CCR Background Wells

Job ID: 240-157750-1

Client Sample ID: MW-15016

Lab Sample ID: 240-157750-3

Date Collected: 10/07/21 10:10

Matrix: Water

Date Received: 10/09/21 10:10

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.934		0.379	0.388	1.00	0.406	pCi/L	10/15/21 11:10	11/08/21 17:29	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	101		40 - 110					10/15/21 11:10	11/08/21 17:29	1

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.393	U	0.304	0.306	1.00	0.478	pCi/L	10/15/21 11:44	11/08/21 13:12	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	101		40 - 110					10/15/21 11:44	11/08/21 13:12	1
Y Carrier	83.7		40 - 110					10/15/21 11:44	11/08/21 13:12	1

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

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	1.33		0.486	0.494	5.00	0.478	pCi/L		11/18/21 22:40	1

Client Sample Results

Client: TRC Environmental Corporation.
 Project/Site: Karn/Weadock CCR Background Wells

Job ID: 240-157750-1

Client Sample ID: MW-15019

Lab Sample ID: 240-157750-4

Date Collected: 10/07/21 08:10

Matrix: Water

Date Received: 10/09/21 10:10

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	1.42		0.469	0.486	1.00	0.494	pCi/L	10/15/21 11:10	11/08/21 17:32	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	101		40 - 110					10/15/21 11:10	11/08/21 17:32	1

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.308	U	0.267	0.268	1.00	0.424	pCi/L	10/15/21 11:44	11/08/21 13:13	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	101		40 - 110					10/15/21 11:44	11/08/21 13:13	1
Y Carrier	84.5		40 - 110					10/15/21 11:44	11/08/21 13:13	1

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

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	1.72		0.540	0.555	5.00	0.494	pCi/L		11/18/21 22:40	1

Client Sample Results

Client: TRC Environmental Corporation.
 Project/Site: Karn/Weadock CCR Background Wells

Job ID: 240-157750-1

Client Sample ID: DUP-04

Lab Sample ID: 240-157750-5

Date Collected: 10/07/21 00:00

Matrix: Water

Date Received: 10/09/21 10:10

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.723		0.374	0.379	1.00	0.485	pCi/L	10/15/21 11:10	11/08/21 17:32	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	103		40 - 110					10/15/21 11:10	11/08/21 17:32	1

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.0453	U	0.221	0.221	1.00	0.395	pCi/L	10/15/21 11:44	11/08/21 13:15	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	103		40 - 110					10/15/21 11:44	11/08/21 13:15	1
Y Carrier	86.0		40 - 110					10/15/21 11:44	11/08/21 13:15	1

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

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.769		0.434	0.439	5.00	0.485	pCi/L		11/18/21 22:40	1

Client Sample Results

Client: TRC Environmental Corporation.
 Project/Site: Karn/Weadock CCR Background Wells

Job ID: 240-157750-1

Client Sample ID: EB-04

Lab Sample ID: 240-157750-6

Date Collected: 10/07/21 10:10

Matrix: Water

Date Received: 10/09/21 10:10

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.666		0.322	0.328	1.00	0.408	pCi/L	10/15/21 11:10	11/08/21 17:32	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	93.3		40 - 110					10/15/21 11:10	11/08/21 17:32	1

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.649	*	0.247	0.254	1.00	0.327	pCi/L	10/15/21 11:44	11/08/21 13:15	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	93.3		40 - 110					10/15/21 11:44	11/08/21 13:15	1
Y Carrier	83.7		40 - 110					10/15/21 11:44	11/08/21 13:15	1

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

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	1.31		0.406	0.415	5.00	0.408	pCi/L		11/18/21 22:40	1

Tracer/Carrier Summary

Client: TRC Environmental Corporation.
Project/Site: Karn/Weadock CCR Background Wells

Job ID: 240-157750-1

Method: 903.0 - Radium-226 (GFPC)

Matrix: Water

Prep Type: Total/NA

Percent Yield (Acceptance Limits)

Lab Sample ID	Client Sample ID	Ba (40-110)
240-157750-1	MW-15002	96.1
240-157750-2	MW-15008	102
240-157750-3	MW-15016	101
240-157750-4	MW-15019	101
240-157750-5	DUP-04	103
240-157750-6	EB-04	93.3
LCS 160-531995/1-A	Lab Control Sample	96.4
LCSD 160-531995/2-A	Lab Control Sample Dup	90.4
MB 160-531995/20-A	Method Blank	82.4

Tracer/Carrier Legend

Ba = Ba Carrier

Method: 904.0 - Radium-228 (GFPC)

Matrix: Water

Prep Type: Total/NA

Percent Yield (Acceptance Limits)

Lab Sample ID	Client Sample ID	Ba (40-110)	Y (40-110)
240-157750-1	MW-15002	96.1	81.5
240-157750-2	MW-15008	102	80.4
240-157750-3	MW-15016	101	83.7
240-157750-4	MW-15019	101	84.5
240-157750-5	DUP-04	103	86.0
240-157750-6	EB-04	93.3	83.7
LCS 160-531998/1-A	Lab Control Sample	96.4	60.2
LCSD 160-531998/2-A	Lab Control Sample Dup	90.4	84.9
MB 160-531998/20-A	Method Blank	82.4	89.0

Tracer/Carrier Legend

Ba = Ba Carrier

Y = Y Carrier

QC Sample Results

Client: TRC Environmental Corporation.
Project/Site: Karn/Weadock CCR Background Wells

Job ID: 240-157750-1

Method: 903.0 - Radium-226 (GFPC)

Lab Sample ID: MB 160-531995/20-A
Matrix: Water
Analysis Batch: 536236

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 531995

Analyte	MB	MB	Count	Total	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
	Result	Qualifier	Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Radium-226	-0.04114	U	0.120	0.120	1.00	0.258	pCi/L	10/15/21 11:10	11/12/21 10:22	1
Carrier	MB	MB	Limits			Prepared	Analyzed	Dil Fac		
	%Yield	Qualifier								
Ba Carrier	82.4		40 - 110			10/15/21 11:10	11/12/21 10:22	1		

Lab Sample ID: LCS 160-531995/1-A
Matrix: Water
Analysis Batch: 535397

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 531995

Analyte	Spike Added	LCS Result	LCS Qual	Total	RL	MDC	Unit	%Rec	%Rec. Limits
				Uncert. (2σ+/-)					
Radium-226	15.1	14.43		1.84	1.00	0.468	pCi/L	95	75 - 125
Carrier	LCS	LCS	Limits			Prepared	Analyzed	Dil Fac	
	%Yield	Qualifier							
Ba Carrier	96.4		40 - 110						

Lab Sample ID: LCSD 160-531995/2-A
Matrix: Water
Analysis Batch: 535397

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 531995

Analyte	Spike Added	LCSD Result	LCSD Qual	Total	RL	MDC	Unit	%Rec	%Rec. Limits	RER	RER
				Uncert. (2σ+/-)							Limit
Radium-226	15.1	12.63		1.71	1.00	0.582	pCi/L	84	75 - 125	0.51	1
Carrier	LCSD	LCSD	Limits			Prepared	Analyzed	Dil Fac			
	%Yield	Qualifier									
Ba Carrier	90.4		40 - 110								

Method: 904.0 - Radium-228 (GFPC)

Lab Sample ID: MB 160-531998/20-A
Matrix: Water
Analysis Batch: 535405

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 531998

Analyte	MB	MB	Count	Total	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
	Result	Qualifier	Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Radium-228	0.5019	U	0.341	0.344	1.00	0.526	pCi/L	10/15/21 11:44	11/08/21 13:16	1
Carrier	MB	MB	Limits			Prepared	Analyzed	Dil Fac		
	%Yield	Qualifier								
Ba Carrier	82.4		40 - 110			10/15/21 11:44	11/08/21 13:16	1		
Y Carrier	89.0		40 - 110			10/15/21 11:44	11/08/21 13:16	1		

QC Sample Results

Client: TRC Environmental Corporation.
 Project/Site: Karn/Weadock CCR Background Wells

Job ID: 240-157750-1

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

Lab Sample ID: LCS 160-531998/1-A
Matrix: Water
Analysis Batch: 535393

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 531998

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits	
									75	125
Radium-228	12.2	15.51		1.85	1.00	0.733	pCi/L	127	75	125
LCS LCS										
Carrier	%Yield	Qualifier	Limits							
Ba Carrier	96.4		40 - 110							
Y Carrier	60.2		40 - 110							

Lab Sample ID: LCSD 160-531998/2-A
Matrix: Water
Analysis Batch: 535393

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 531998

Analyte	Spike Added	LCSD Result	LCSD Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits		RER	Limit
									75	125	0.51	1
Radium-228	12.2	13.75		1.59	1.00	0.509	pCi/L	112	75	125	0.51	1
LCSD LCSD												
Carrier	%Yield	Qualifier	Limits									
Ba Carrier	90.4		40 - 110									
Y Carrier	84.9		40 - 110									

QC Association Summary

Client: TRC Environmental Corporation.
Project/Site: Karn/Weadock CCR Background Wells

Job ID: 240-157750-1

Rad

Prep Batch: 531995

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-157750-1	MW-15002	Total/NA	Water	PrecSep STD	
240-157750-2	MW-15008	Total/NA	Water	PrecSep STD	
240-157750-3	MW-15016	Total/NA	Water	PrecSep STD	
240-157750-4	MW-15019	Total/NA	Water	PrecSep STD	
240-157750-5	DUP-04	Total/NA	Water	PrecSep STD	
240-157750-6	EB-04	Total/NA	Water	PrecSep STD	
MB 160-531995/20-A	Method Blank	Total/NA	Water	PrecSep STD	
LCS 160-531995/1-A	Lab Control Sample	Total/NA	Water	PrecSep STD	
LCSD 160-531995/2-A	Lab Control Sample Dup	Total/NA	Water	PrecSep STD	

Prep Batch: 531998

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-157750-1	MW-15002	Total/NA	Water	PrecSep_0	
240-157750-2	MW-15008	Total/NA	Water	PrecSep_0	
240-157750-3	MW-15016	Total/NA	Water	PrecSep_0	
240-157750-4	MW-15019	Total/NA	Water	PrecSep_0	
240-157750-5	DUP-04	Total/NA	Water	PrecSep_0	
240-157750-6	EB-04	Total/NA	Water	PrecSep_0	
MB 160-531998/20-A	Method Blank	Total/NA	Water	PrecSep_0	
LCS 160-531998/1-A	Lab Control Sample	Total/NA	Water	PrecSep_0	
LCSD 160-531998/2-A	Lab Control Sample Dup	Total/NA	Water	PrecSep_0	

Lab Chronicle

Client: TRC Environmental Corporation.
Project/Site: Karn/Weadock CCR Background Wells

Job ID: 240-157750-1

Client Sample ID: MW-15002

Lab Sample ID: 240-157750-1

Date Collected: 10/07/21 09:08

Matrix: Water

Date Received: 10/09/21 10:10

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	PrecSep STD			531995	10/15/21 11:10	BMP	TAL SL
Total/NA	Analysis	903.0		1	535397	11/08/21 17:29	FLC	TAL SL
Total/NA	Prep	PrecSep_0			531998	10/15/21 11:44	BMP	TAL SL
Total/NA	Analysis	904.0		1	535390	11/08/21 13:12	JLP	TAL SL
Total/NA	Analysis	Ra226_Ra228		1	537496	11/18/21 22:40	EMH	TAL SL

Client Sample ID: MW-15008

Lab Sample ID: 240-157750-2

Date Collected: 10/06/21 16:02

Matrix: Water

Date Received: 10/09/21 10:10

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	PrecSep STD			531995	10/15/21 11:10	BMP	TAL SL
Total/NA	Analysis	903.0		1	535397	11/08/21 17:29	FLC	TAL SL
Total/NA	Prep	PrecSep_0			531998	10/15/21 11:44	BMP	TAL SL
Total/NA	Analysis	904.0		1	535390	11/08/21 13:12	JLP	TAL SL
Total/NA	Analysis	Ra226_Ra228		1	537496	11/18/21 22:40	EMH	TAL SL

Client Sample ID: MW-15016

Lab Sample ID: 240-157750-3

Date Collected: 10/07/21 10:10

Matrix: Water

Date Received: 10/09/21 10:10

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	PrecSep STD			531995	10/15/21 11:10	BMP	TAL SL
Total/NA	Analysis	903.0		1	535397	11/08/21 17:29	FLC	TAL SL
Total/NA	Prep	PrecSep_0			531998	10/15/21 11:44	BMP	TAL SL
Total/NA	Analysis	904.0		1	535390	11/08/21 13:12	JLP	TAL SL
Total/NA	Analysis	Ra226_Ra228		1	537496	11/18/21 22:40	EMH	TAL SL

Client Sample ID: MW-15019

Lab Sample ID: 240-157750-4

Date Collected: 10/07/21 08:10

Matrix: Water

Date Received: 10/09/21 10:10

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	PrecSep STD			531995	10/15/21 11:10	BMP	TAL SL
Total/NA	Analysis	903.0		1	535393	11/08/21 17:32	FLC	TAL SL
Total/NA	Prep	PrecSep_0			531998	10/15/21 11:44	BMP	TAL SL
Total/NA	Analysis	904.0		1	535390	11/08/21 13:13	JLP	TAL SL
Total/NA	Analysis	Ra226_Ra228		1	537496	11/18/21 22:40	EMH	TAL SL

Lab Chronicle

Client: TRC Environmental Corporation.
 Project/Site: Karn/Weadock CCR Background Wells

Job ID: 240-157750-1

Client Sample ID: DUP-04

Lab Sample ID: 240-157750-5

Date Collected: 10/07/21 00:00

Matrix: Water

Date Received: 10/09/21 10:10

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	PrecSep STD			531995	10/15/21 11:10	BMP	TAL SL
Total/NA	Analysis	903.0		1	535393	11/08/21 17:32	FLC	TAL SL
Total/NA	Prep	PrecSep_0			531998	10/15/21 11:44	BMP	TAL SL
Total/NA	Analysis	904.0		1	535405	11/08/21 13:15	FLC	TAL SL
Total/NA	Analysis	Ra226_Ra228		1	537496	11/18/21 22:40	EMH	TAL SL

Client Sample ID: EB-04

Lab Sample ID: 240-157750-6

Date Collected: 10/07/21 10:10

Matrix: Water

Date Received: 10/09/21 10:10

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	PrecSep STD			531995	10/15/21 11:10	BMP	TAL SL
Total/NA	Analysis	903.0		1	535393	11/08/21 17:32	FLC	TAL SL
Total/NA	Prep	PrecSep_0			531998	10/15/21 11:44	BMP	TAL SL
Total/NA	Analysis	904.0		1	535405	11/08/21 13:15	FLC	TAL SL
Total/NA	Analysis	Ra226_Ra228		1	537496	11/18/21 22:40	EMH	TAL SL

Laboratory References:

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

Accreditation/Certification Summary

Client: TRC Environmental Corporation.
 Project/Site: Karn/Weadock CCR Background Wells

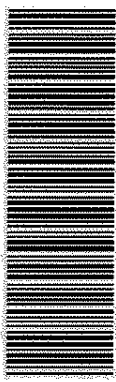
Job ID: 240-157750-1

Laboratory: Eurofins TestAmerica, St. Louis

All accreditations/certifications held by this laboratory are listed. Not all accreditations/certifications are applicable to this report.

Authority	Program	Identification Number	Expiration Date
Alaska (UST)	State	20-001	05-06-22
ANAB	Dept. of Defense ELAP	L2305	04-06-22
ANAB	Dept. of Energy	L2305.01	04-06-22
ANAB	ISO/IEC 17025	L2305	04-06-22
Arizona	State	AZ0813	12-08-21
California	Los Angeles County Sanitation Districts	10259	06-30-22
California	State	2886	06-30-21 *
Connecticut	State	PH-0241	03-31-23
Florida	NELAP	E87689	06-30-22
HI - RadChem Recognition	State	n/a	06-30-22
Illinois	NELAP	200023	11-30-22
Iowa	State	373	12-01-22
Kansas	NELAP	E-10236	10-31-22
Kentucky (DW)	State	KY90125	01-01-22
Kentucky (WW)	State	KY90125 (Permit KY0004049)	12-31-21
Louisiana	NELAP	04080	06-30-22
Louisiana (DW)	State	LA011	12-31-21
Maryland	State	310	09-30-22
MI - RadChem Recognition	State	9005	06-30-22
Missouri	State	780	06-30-22
Nevada	State	MO000542020-1	07-31-22
New Jersey	NELAP	MO002	06-30-22
New York	NELAP	11616	04-01-22
North Dakota	State	R-207	06-30-22
NRC	NRC	24-24817-01	12-31-22
Oklahoma	State	9997	08-31-22
Oregon	NELAP	4157	09-01-22
Pennsylvania	NELAP	68-00540	03-01-22
South Carolina	State	85002001	06-30-22
Texas	NELAP	T104704193	07-31-22
US Fish & Wildlife	US Federal Programs	058448	07-31-22
USDA	US Federal Programs	P330-17-00028	03-11-23
Utah	NELAP	MO000542021-14	08-01-22
Virginia	NELAP	10310	06-14-22
Washington	State	C592	08-30-22
West Virginia DEP	State	381	10-31-22

* Accreditation/Certification renewal pending - accreditation/certification considered valid.

Client Information		Lab Pkt: Brooks, Kris M	Carrier Tracking No(s): COC No: 240-87168-33282.1
Client Contact: Jacob Krenz		E-Mail: Kris.Brooks@Eurofinset.com	State of Origin: Page 1 of 1
Company: TRC Environmental Corporation.		PWSID:	Job #:
Address: 1540 Eisenhower Place		Analysis Requested	
City: Ann Arbor		Preservation Codes:	
State, Zip: MI 48108-7080		A HCL M Hexane B NaOH N None C Zn Acetate O AsNaO2 D Nitric Acid P Na2O4S E NaHSO4 Q Na2SO3 F MeOH R Na2S2O3 G Amchlor S H2SO4 H Ascorbic Acid T TSP Dodecahydrate I Ice U Acetone J DI Water V MCAA K EDTA W pH 4-5 L EDA Z other (specify) Other:	
Phone: 734-971 7080(Tel) 734-971-9022(Fax)		Total Number of Containers	
Email: JKrenz@trccompanies.com		Special Instructions/Note	
Project Name: Karm/Weadock CCR Background Well		903.0, Ra226Ra228, GPC	
Site: 24024154		904.0 Standard Target List	
Due Date Requested:		Field Filtered Sample (Yes or No)	
TAT Requested (days):		Perform MS/MSD (Yes or No)	
Compliance Project: <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		903.0, Ra226Ra228, GPC	
PO #: TBD		904.0 Standard Target List	
WO #:		Field Filtered Sample (Yes or No)	
Project #: 24024154		Perform MS/MSD (Yes or No)	
SSOW#:		903.0, Ra226Ra228, GPC	
Sample Identification		904.0 Standard Target List	
MW-15002	Sample Date: 10-7-21 0908	Sample Time: 0908	Matrix: Water
MW 15008	Sample Date: 10-6-21 1602	Sample Time: 1602	Matrix: Water
MW 15016	Sample Date: 10-7-21 1010	Sample Time: 1010	Matrix: Water
MW 15019	Sample Date: 10-7-21 0910	Sample Time: 0910	Matrix: Water
DUP-04	Sample Date: 10-7-21	Sample Time: 1010	Matrix: Water
EB-04	Sample Date: 10-7-21	Sample Time: 1010	Matrix: Water
 240-157750 Chain of Custody			
Possible Hazard Identification <input type="checkbox"/> Non-Hazard <input type="checkbox"/> Flammable <input type="checkbox"/> Skin Irritant <input type="checkbox"/> Poison B <input checked="" type="checkbox"/> Unknown <input type="checkbox"/> Radiological Deliverable Requested I II III IV Other (specify)			
Empty Kit Relinquished by Relinquished by: [Signature] Date: 10/7/21 Relinquished by: [Signature] Date: 10-3-21 1152 Relinquished by: [Signature] Date: 10/6/21 1045 Custody Seals Intact: <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No Custody Seal No.			
Sample Disposal (A fee may be assessed if samples are retained longer than 1 month) <input type="checkbox"/> Return To Client <input checked="" type="checkbox"/> Disposal By Lab <input type="checkbox"/> Archive For _____ Months Special Instructions/QC Requirements.			
Method of Shipment: Received by: [Signature] Date/Time: 10/20/21 174 Received by: [Signature] Date/Time: 10/18/21 1151 Received by: [Signature] Date/Time: 10/19/21 1010 Cooler Temperatures(s) °C and Other Remarks.			



Eurofins TestAmerica Canton Sample Receipt Form/Narrative

Login # : 157750

Canton Facility

Client TRC Site Name _____

Cooler unpacked by: Treit

Cooler Received on 10/9/21 Opened on 10/9/21

FedEx 1st Grd. ~~UPS~~ FAS Clippel Client Drop Off TestAmerica Courier Other

Receipt After-hours Drop-off Date/Time TC 10/9-21 Storage Location _____

TestAmerica Cooler # 70 Foam Box Client Cooler Box Other _____
Packing material used. Bubble Wrap Foam Plastic Bag None Other _____
COOLANT Wet Ice Blue Ice Dry Ice Water None _____

1 Cooler temperature upon receipt See Multiple Cooler Form
IR GUN# IR-14 (CF +0.1 °C) Observed Cooler Temp _____ °C Corrected Cooler Temp _____ °C
IR GUN #IR-15 (CF +0.2 °C) Observed Cooler Temp _____ °C Corrected Cooler Temp _____ °C

2 Were tamper/custody seals on the outside of the cooler(s)? If Yes Quantity 1 Yes No
-Were the seals on the outside of the cooler(s) signed & dated? Yes No NA
Were tamper/custody seals on the bottle(s) or bottle kits (LLHg/MeHg)? Yes No
Were tamper/custody seals intact and uncompromised? Yes No NA

Tests that are not checked for pH by Receiving:
VOAs
Oil and Grease
TOC

3 Shippers' packing slip attached to the cooler(s)? Yes No
4 Did custody papers accompany the sample(s)? Yes No
5 Were the custody papers relinquished & signed in the appropriate place? Yes No
6 Was/were the person(s) who collected the samples clearly identified on the COC? Yes No
7 Did all bottles arrive in good condition (Unbroken)? Yes No
8 Could all bottle labels (ID/Date/Time) be reconciled with the COC? Yes No

9 For each sample, does the COC specify preservatives (Y/N), # of containers (Y/N), and sample type of grab/comp (Y/N)?
10 Were correct bottle(s) used for the test(s) indicated? Yes No
11 Sufficient quantity received to perform indicated analyses? Yes No
12 Are these work share samples and all listed on the COC? Yes No

If yes, Questions 13-17 have been checked at the originating laboratory
13 Were all preserved sample(s) at the correct pH upon receipt? Yes No NA pH Strip Lot# HC157842
14 Were VOAs on the COC? Yes No
15 Were air bubbles >6 mm in any VOA vials? Yes ← Larger than this. Yes No NA
16 Was a VOA trip blank present in the cooler(s)? Trip Blank Lot # _____ Yes No
17 Was a LL Hg or Me Hg trip blank present? Yes No

Contacted PM _____ Date _____ by _____ via Verbal Voice Mail Other

Concerning _____

18. CHAIN OF CUSTODY & SAMPLE DISCREPANCIES additional next page

Samples processed by: _____

19. SAMPLE CONDITION

Sample(s) _____ were received after the recommended holding time had expired.
Sample(s) _____ were received in a broken container
Sample(s) _____ were received with bubble >6 mm in diameter (Notify PM)

20. SAMPLE PRESERVATION

Sample(s) _____ were further preserved in the laboratory
Time preserved _____ Preservative(s) added/Lot number(s) _____

VOA Sample Preservation Date/Time VOAs Frozen. _____

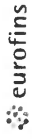
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Temperature readings

<u>Client Sample ID</u>	<u>Lab ID</u>	<u>Container Type</u>	<u>Container</u>		<u>Preservative</u>	
			<u>pH</u>	<u>Temp</u>	<u>Added (mls)</u>	<u>Lot #</u>
MW 15002	240-157750-A 1	Plastic 1 liter Nitric Acid	<2	_____	_____	_____
MW-15002	240-157750-B 1	Plastic 1 liter - Nitric Acid	<2	_____	_____	_____
MW-15008	240-157750-A-2	Plastic 1 liter - Nitric Acid	<2	_____	_____	_____
MW-15008	240-157750-B 2	Plastic 1 liter - Nitric Acid	<2	_____	_____	_____
MW 15016	240-157750-A-3	Plastic 1 liter Nitric Acid	<2	_____	_____	_____
MW-15016	240-157750-B-3	Plastic 1 liter Nitric Acid	<2	_____	_____	_____
MW 15019	240-157750-A-4	Plastic 1 liter Nitric Acid	<2	_____	_____	_____
MW 15019	240-157750-B-4	Plastic 1 liter Nitric Acid	<2	_____	_____	_____
DUP-04	240-157750-A 5	Plastic 1 liter - Nitric Acid	<2	_____	_____	_____
DUP-04	240-157750-B-5	Plastic 1 liter - Nitric Acid	<2	_____	_____	_____
EB-04	240-157750-A-6	Plastic 1 liter - Nitric Acid	<2	_____	_____	_____

Eurofins TestAmerica, Canton
 4101 Shuffel Street NW
 North Canton, OH 44720
 Phone: 330-497-9396 Fax: 330-497-0772

Chain of Custody Record



Environment Testing
 America



Client Information (Sub Contract Lab)		Lab PM Brooks, Kris M	Carrier Tracking No(s) 240-143998.1							
Client Contact: Shipping/Receiving		E-Mail Kris.Brooks@Eurofins.com	Page Page 1 of 1							
Company TestAmerica Laboratories, Inc.		Address 13715 Rider Trail North, Earth City State, Zip MO, 63045	Job # 240-157750-1							
Phone 314-298-8566(Tel) 314-298-8757(Fax)		PO #	Preservation Codes: A - HCL B - NaOH C - Zn Acetate D - Nitric Acid E - NaHSO4 F - MeOH G - Anchlor H - Ascorbic Acid I - Ice J - DI Water K - EDTA L - EDA Other: M - Hexane N - None O - ASH02 P - Na2OHS Q - Na2SO3 R - Na2SO4 S - H2SO4 T - TSP Dodecahydrate U - Acetone V - MCAA W - pH 4-5 Z - other (specify)							
Email		WO #								
Project Name Karm/Weadock CCR Groundwater Monitoring		Project # 24024154	Analysis Requested							
Site		SSOW#								
Sample Identification - Client ID (Lab ID)	Sample Date	Sample Time	Sample Type (C=Comp, G=grab)	Matrix (W=water, S=solid, O=soil, BT=Tissue, A=AU)	Field Filtered Sample (Yes or No)	Performance M/MSD (Yes or No)	904.0/PreSep, 0 Standard Target List	903.0/PreSep, STD Standard Target List	Total Number of Containers	Special Instructions/Note:
MW-15002 (240-157750-1)	10/7/21	09:08 Eastern		Water	X	X			2	TVA protocol - Ra-226+228 action limit at 5.0 pCi/L.
MW-15008 (240-157750-2)	10/6/21	16:02 Eastern		Water	X	X			2	TVA protocol - Ra-226+228 action limit at 5.0 pCi/L.
MW-15016 (240-157750-3)	10/7/21	10:10 Eastern		Water	X	X			2	TVA protocol - Ra-226+228 action limit at 5.0 pCi/L.
MW-15019 (240-157750-4)	10/7/21	08:10 Eastern		Water	X	X			2	TVA protocol - Ra-226+228 action limit at 5.0 pCi/L.
DUP-04 (240-157750-5)	10/7/21	Eastern		Water	X	X			2	TVA protocol - Ra-226+228 action limit at 5.0 pCi/L.
EB-04 (240-157750-6)	10/7/21	10:10 Eastern		Water	X	X			1	TVA protocol - Ra-226+228 action limit at 5.0 pCi/L.
<p>Note: Since laboratory accreditations are subject to change, Eurofins TestAmerica places the ownership of method, analyte & accreditation compliance upon our subcontract laboratories. This sample shipment is forwarded under chain-of-custody. If the laboratory does not currently maintain accreditation in the State of Origin listed above for analysis/test/matrix being analyzed, the samples must be shipped back to the Eurofins TestAmerica laboratory or other instructions will be provided. Any changes to accreditation status should be brought to Eurofins TestAmerica attention immediately. If all requested accreditations are current to date, return the signed Chain of Custody attesting to said compliance to Eurofins TestAmerica.</p>										
Possible Hazard Identification										
<input type="checkbox"/> Unconfirmed <input type="checkbox"/> Return To Client <input type="checkbox"/> Disposal By Lab <input type="checkbox"/> Archive For _____ Months										
Deliverable Requested: I, II, III, IV, Other (specify) _____										
Empty Kit Relinquished by: _____ Date: _____ Time: _____										
Relinquished by: EA Date: 10-11-21 Time: 1034 Company: ETA										
Relinquished by: FEDEX Date: _____ Time: _____ Company: _____										
Relinquished by: MICHA KEMALINGA Date: OCT 12 2021 09:05 Company: ETA S/N										
Custody Seals Intact: <input type="checkbox"/> Yes <input type="checkbox"/> No Cooler Temperature(s) °C and Other Remarks: _____										



Login Sample Receipt Checklist

Client: TRC Environmental Corporation.

Job Number: 240-157750-1

Login Number: 157750

List Number: 2

Creator: Korrinhizer, Micha L

List Source: Eurofins TestAmerica, St. Louis

List Creation: 10/12/21 05:16 PM

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



ANALYTICAL REPORT

Eurofins TestAmerica, Canton
4101 Shuffel Street NW
North Canton, OH 44720
Tel: (330)497-9396

Laboratory Job ID: 240-157688-1

Client Project/Site: Karn/Weadock CCR DEK Bottom Ash Pond

For:

TRC Environmental Corporation.
1540 Eisenhower Place
Ann Arbor, Michigan 48108-7080

Attn: Darby Litz



*Authorized for release by:
11/19/2021 8:00:40 PM*

Kris Brooks, Project Manager II
(330)966-9790
Kris.Brooks@Eurofinset.com

LINKS

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results through
TotalAccess

Have a Question?



Visit us at:

www.eurofinsus.com/Env

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

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



Table of Contents

Cover Page	1
Table of Contents	2
Definitions/Glossary	3
Case Narrative	4
Method Summary	5
Sample Summary	6
Client Sample Results	7
Tracer Carrier Summary	12
QC Sample Results	13
QC Association Summary	14
Lab Chronicle	15
Certification Summary	17
Chain of Custody	18
Receipt Checklists	22

Definitions/Glossary

Client: TRC Environmental Corporation.
Project/Site: Karn/Weadock CCR DEK Bottom Ash Pond

Job ID: 240-157688-1

Qualifiers

Rad

Qualifier	Qualifier Description
U	Result is less than the sample detection limit.

Glossary

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

Case Narrative

Client: TRC Environmental Corporation.
Project/Site: Karn/Weadock CCR DEK Bottom Ash Pond

Job ID: 240-157688-1

Job ID: 240-157688-1

Laboratory: Eurofins TestAmerica, Canton

Narrative

Job Narrative 240-157688-1

Comments

The EPA Method 903.0 Radium-226, EPA Method 904.0 Radium-228, and Ra226_Ra228 Combined Radium 226 and Radium 228 analyses were performed at the Eurofins TestAmerica St. Louis laboratory.

Receipt

The samples were received on 10/8/2021 8:00 AM. Unless otherwise noted below, the samples arrived in good condition, and where required, properly preserved and on ice. The temperature of the cooler at receipt was 0.6° C.

RAD

Method 903.0: Radium 226 batch 531995

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

Radiochemistry sample results are reported with the count date/time applied as the Activity Reference Date. DEK-MW-15002 (240-157688-1), DEK-MW-15004 (240-157688-2), DEK-MW-15005 (240-157688-3), DEK-MW-15006 (240-157688-4), DUP-DEK-BAP (240-157688-5), (LCS 160-531995/1-A), (LCSD 160-531995/2-A) and (MB 160-531995/20-A)

Method 904.0: Radium 228 batch 531998

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

Radiochemistry sample results are reported with the count date/time applied as the Activity Reference Date.

DEK-MW-15002 (240-157688-1), DEK-MW-15004 (240-157688-2), DEK-MW-15005 (240-157688-3), DEK-MW-15006 (240-157688-4), DUP-DEK-BAP (240-157688-5), (LCSD 160-531998/2-A) and (MB 160-531998/20-A)

Method PrecSep_0: Radium-228 Prep Batch 160-531998

The following samples were prepared at a reduced aliquot due to Matrix: DEK-MW-15002 (240-157688-1), DEK-MW-15004 (240-157688-2), DEK-MW-15005 (240-157688-3), DEK-MW-15006 (240-157688-4) and DUP-DEK-BAP (240-157688-5). A laboratory control sample/ laboratory control sample duplicate (LCS/LCSD) were prepared instead of a sample duplicate (DUP) to demonstrate batch precision.

Method PrecSep STD: 160-531995

The following samples were prepared at a reduced aliquot due to Matrix: DEK-MW-15002 (240-157688-1), DEK-MW-15004 (240-157688-2), DEK-MW-15005 (240-157688-3), DEK-MW-15006 (240-157688-4) and DUP-DEK-BAP (240-157688-5). As a result a laboratory control sample/ laboratory control sample duplicate (LCS/LCSD) were prepared instead of a sample duplicate (DUP) to demonstrate batch precision.

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

Method Summary

Client: TRC Environmental Corporation.
Project/Site: Karn/Weadock CCR DEK Bottom Ash Pond

Job ID: 240-157688-1

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

Protocol References:

EPA = US Environmental Protection Agency

None = None

TAL-STL = TestAmerica Laboratories, St. Louis, Facility Standard Operating Procedure.

Laboratory References:

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

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Sample Summary

Client: TRC Environmental Corporation.
Project/Site: Karn/Weadock CCR DEK Bottom Ash Pond

Job ID: 240-157688-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
240-157688-1	DEK-MW-15002	Water	10/04/21 13:37	10/08/21 08:00
240-157688-2	DEK-MW-15004	Water	10/04/21 14:46	10/08/21 08:00
240-157688-3	DEK-MW-15005	Water	10/04/21 11:39	10/08/21 08:00
240-157688-4	DEK-MW-15006	Water	10/04/21 12:32	10/08/21 08:00
240-157688-5	DUP-DEK-BAP	Water	10/04/21 00:00	10/08/21 08:00

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Client Sample Results

Client: TRC Environmental Corporation.
 Project/Site: Karn/Weadock CCR DEK Bottom Ash Pond

Job ID: 240-157688-1

Client Sample ID: DEK-MW-15002

Lab Sample ID: 240-157688-1

Date Collected: 10/04/21 13:37

Matrix: Water

Date Received: 10/08/21 08:00

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	1.47		0.485	0.503	1.00	0.529	pCi/L	10/15/21 11:10	11/08/21 17:26	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	99.7		40 - 110					10/15/21 11:10	11/08/21 17:26	1

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.827		0.384	0.391	1.00	0.567	pCi/L	10/15/21 11:44	11/08/21 13:11	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	99.7		40 - 110					10/15/21 11:44	11/08/21 13:11	1
Y Carrier	84.5		40 - 110					10/15/21 11:44	11/08/21 13:11	1

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

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	2.29		0.619	0.637	5.00	0.567	pCi/L		11/18/21 22:40	1

Client Sample Results

Client: TRC Environmental Corporation.
 Project/Site: Karn/Weadock CCR DEK Bottom Ash Pond

Job ID: 240-157688-1

Client Sample ID: DEK-MW-15004

Lab Sample ID: 240-157688-2

Date Collected: 10/04/21 14:46

Matrix: Water

Date Received: 10/08/21 08:00

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	1.74		0.487	0.512	1.00	0.437	pCi/L	10/15/21 11:10	11/08/21 17:26	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	101		40 - 110					10/15/21 11:10	11/08/21 17:26	1

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	1.23		0.402	0.418	1.00	0.544	pCi/L	10/15/21 11:44	11/08/21 13:11	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	101		40 - 110					10/15/21 11:44	11/08/21 13:11	1
Y Carrier	81.5		40 - 110					10/15/21 11:44	11/08/21 13:11	1

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

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	2.97		0.631	0.661	5.00	0.544	pCi/L		11/18/21 22:40	1

Client Sample Results

Client: TRC Environmental Corporation.
 Project/Site: Karn/Weadock CCR DEK Bottom Ash Pond

Job ID: 240-157688-1

Client Sample ID: DEK-MW-15005

Lab Sample ID: 240-157688-3

Date Collected: 10/04/21 11:39

Matrix: Water

Date Received: 10/08/21 08:00

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	1.12		0.418	0.430	1.00	0.465	pCi/L	10/15/21 11:10	11/08/21 17:26	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	102		40 - 110					10/15/21 11:10	11/08/21 17:26	1

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.940		0.337	0.348	1.00	0.457	pCi/L	10/15/21 11:44	11/08/21 13:11	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	102		40 - 110					10/15/21 11:44	11/08/21 13:11	1
Y Carrier	87.1		40 - 110					10/15/21 11:44	11/08/21 13:11	1

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

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	2.06		0.537	0.553	5.00	0.465	pCi/L		11/18/21 22:40	1

Client Sample Results

Client: TRC Environmental Corporation.
 Project/Site: Karn/Weadock CCR DEK Bottom Ash Pond

Job ID: 240-157688-1

Client Sample ID: DEK-MW-15006

Lab Sample ID: 240-157688-4

Date Collected: 10/04/21 12:32

Matrix: Water

Date Received: 10/08/21 08:00

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.797		0.357	0.364	1.00	0.424	pCi/L	10/15/21 11:10	11/08/21 17:27	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	105		40 - 110					10/15/21 11:10	11/08/21 17:27	1

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.704		0.327	0.333	1.00	0.472	pCi/L	10/15/21 11:44	11/08/21 13:11	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	105		40 - 110					10/15/21 11:44	11/08/21 13:11	1
Y Carrier	82.2		40 - 110					10/15/21 11:44	11/08/21 13:11	1

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

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	1.50		0.484	0.493	5.00	0.472	pCi/L		11/18/21 22:40	1

Client Sample Results

Client: TRC Environmental Corporation.
 Project/Site: Karn/Weadock CCR DEK Bottom Ash Pond

Job ID: 240-157688-1

Client Sample ID: DUP-DEK-BAP

Lab Sample ID: 240-157688-5

Date Collected: 10/04/21 00:00

Matrix: Water

Date Received: 10/08/21 08:00

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.832		0.369	0.377	1.00	0.440	pCi/L	10/15/21 11:10	11/08/21 17:27	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	106		40 - 110					10/15/21 11:10	11/08/21 17:27	1

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.518		0.325	0.329	1.00	0.499	pCi/L	10/15/21 11:44	11/08/21 13:12	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	106		40 - 110					10/15/21 11:44	11/08/21 13:12	1
Y Carrier	80.7		40 - 110					10/15/21 11:44	11/08/21 13:12	1

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

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	1.35		0.492	0.500	5.00	0.499	pCi/L		11/18/21 22:40	1

Tracer/Carrier Summary

Client: TRC Environmental Corporation.
Project/Site: Karn/Weadock CCR DEK Bottom Ash Pond

Job ID: 240-157688-1

Method: 903.0 - Radium-226 (GFPC)

Matrix: Water

Prep Type: Total/NA

		Percent Yield (Acceptance Limits)	
Lab Sample ID	Client Sample ID	Ba (40-110)	
240-157688-1	DEK-MW-15002	99.7	
240-157688-2	DEK-MW-15004	101	
240-157688-3	DEK-MW-15005	102	
240-157688-4	DEK-MW-15006	105	
240-157688-5	DUP-DEK-BAP	106	
LCS 160-531995/1-A	Lab Control Sample	96.4	
LCSD 160-531995/2-A	Lab Control Sample Dup	90.4	
MB 160-531995/20-A	Method Blank	82.4	

Tracer/Carrier Legend
Ba = Ba Carrier

Method: 904.0 - Radium-228 (GFPC)

Matrix: Water

Prep Type: Total/NA

		Percent Yield (Acceptance Limits)	
Lab Sample ID	Client Sample ID	Ba (40-110)	Y (40-110)
240-157688-1	DEK-MW-15002	99.7	84.5
240-157688-2	DEK-MW-15004	101	81.5
240-157688-3	DEK-MW-15005	102	87.1
240-157688-4	DEK-MW-15006	105	82.2
240-157688-5	DUP-DEK-BAP	106	80.7

Tracer/Carrier Legend
Ba = Ba Carrier
Y = Y Carrier

QC Sample Results

Client: TRC Environmental Corporation.
 Project/Site: Karn/Weadock CCR DEK Bottom Ash Pond

Job ID: 240-157688-1

Method: 903.0 - Radium-226 (GFPC)

Lab Sample ID: MB 160-531995/20-A
Matrix: Water
Analysis Batch: 536236

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 531995

Analyte	MB	MB	Count	Total	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
	Result	Qualifier	Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Radium-226	-0.04114	U	0.120	0.120	1.00	0.258	pCi/L	10/15/21 11:10	11/12/21 10:22	1
Carrier	MB %Yield	MB Qualifier	Limits				Prepared		Analyzed	
Ba Carrier	82.4		40 - 110				10/15/21 11:10		11/12/21 10:22	

Lab Sample ID: LCS 160-531995/1-A
Matrix: Water
Analysis Batch: 535397

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 531995

Analyte	Spike Added	LCS Result	LCS Qual	Total	RL	MDC	Unit	%Rec	%Rec. Limits
				Uncert. (2σ+/-)					
Radium-226	15.1	14.43		1.84	1.00	0.468	pCi/L	95	75 - 125
Carrier	LCS %Yield	LCS Qualifier	Limits						
Ba Carrier	96.4		40 - 110						

Lab Sample ID: LCSD 160-531995/2-A
Matrix: Water
Analysis Batch: 535397

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 531995

Analyte	Spike Added	LCSD Result	LCSD Qual	Total	RL	MDC	Unit	%Rec	%Rec. Limits	RER	RER
				Uncert. (2σ+/-)							Limit
Radium-226	15.1	12.63		1.71	1.00	0.582	pCi/L	84	75 - 125	0.51	1
Carrier	LCSD %Yield	LCSD Qualifier	Limits								
Ba Carrier	90.4		40 - 110								

QC Association Summary

Client: TRC Environmental Corporation.
Project/Site: Karn/Weadock CCR DEK Bottom Ash Pond

Job ID: 240-157688-1

Rad

Prep Batch: 531995

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-157688-1	DEK-MW-15002	Total/NA	Water	PrecSep STD	
240-157688-2	DEK-MW-15004	Total/NA	Water	PrecSep STD	
240-157688-3	DEK-MW-15005	Total/NA	Water	PrecSep STD	
240-157688-4	DEK-MW-15006	Total/NA	Water	PrecSep STD	
240-157688-5	DUP-DEK-BAP	Total/NA	Water	PrecSep STD	
MB 160-531995/20-A	Method Blank	Total/NA	Water	PrecSep STD	
LCS 160-531995/1-A	Lab Control Sample	Total/NA	Water	PrecSep STD	
LCSD 160-531995/2-A	Lab Control Sample Dup	Total/NA	Water	PrecSep STD	

Prep Batch: 531998

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-157688-1	DEK-MW-15002	Total/NA	Water	PrecSep_0	
240-157688-2	DEK-MW-15004	Total/NA	Water	PrecSep_0	
240-157688-3	DEK-MW-15005	Total/NA	Water	PrecSep_0	
240-157688-4	DEK-MW-15006	Total/NA	Water	PrecSep_0	
240-157688-5	DUP-DEK-BAP	Total/NA	Water	PrecSep_0	

Lab Chronicle

Client: TRC Environmental Corporation.
Project/Site: Karn/Weadock CCR DEK Bottom Ash Pond

Job ID: 240-157688-1

Client Sample ID: DEK-MW-15002

Lab Sample ID: 240-157688-1

Date Collected: 10/04/21 13:37

Matrix: Water

Date Received: 10/08/21 08:00

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	PrecSep STD			531995	10/15/21 11:10	BMP	TAL SL
Total/NA	Analysis	903.0		1	535397	11/08/21 17:26	FLC	TAL SL
Total/NA	Prep	PrecSep_0			531998	10/15/21 11:44	BMP	TAL SL
Total/NA	Analysis	904.0		1	535390	11/08/21 13:11	JLP	TAL SL
Total/NA	Analysis	Ra226_Ra228		1	537496	11/18/21 22:40	EMH	TAL SL

Client Sample ID: DEK-MW-15004

Lab Sample ID: 240-157688-2

Date Collected: 10/04/21 14:46

Matrix: Water

Date Received: 10/08/21 08:00

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	PrecSep STD			531995	10/15/21 11:10	BMP	TAL SL
Total/NA	Analysis	903.0		1	535397	11/08/21 17:26	FLC	TAL SL
Total/NA	Prep	PrecSep_0			531998	10/15/21 11:44	BMP	TAL SL
Total/NA	Analysis	904.0		1	535390	11/08/21 13:11	JLP	TAL SL
Total/NA	Analysis	Ra226_Ra228		1	537496	11/18/21 22:40	EMH	TAL SL

Client Sample ID: DEK-MW-15005

Lab Sample ID: 240-157688-3

Date Collected: 10/04/21 11:39

Matrix: Water

Date Received: 10/08/21 08:00

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	PrecSep STD			531995	10/15/21 11:10	BMP	TAL SL
Total/NA	Analysis	903.0		1	535397	11/08/21 17:26	FLC	TAL SL
Total/NA	Prep	PrecSep_0			531998	10/15/21 11:44	BMP	TAL SL
Total/NA	Analysis	904.0		1	535390	11/08/21 13:11	JLP	TAL SL
Total/NA	Analysis	Ra226_Ra228		1	537496	11/18/21 22:40	EMH	TAL SL

Client Sample ID: DEK-MW-15006

Lab Sample ID: 240-157688-4

Date Collected: 10/04/21 12:32

Matrix: Water

Date Received: 10/08/21 08:00

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	PrecSep STD			531995	10/15/21 11:10	BMP	TAL SL
Total/NA	Analysis	903.0		1	535397	11/08/21 17:27	FLC	TAL SL
Total/NA	Prep	PrecSep_0			531998	10/15/21 11:44	BMP	TAL SL
Total/NA	Analysis	904.0		1	535390	11/08/21 13:11	JLP	TAL SL
Total/NA	Analysis	Ra226_Ra228		1	537496	11/18/21 22:40	EMH	TAL SL

Lab Chronicle

Client: TRC Environmental Corporation.
Project/Site: Karn/Weadock CCR DEK Bottom Ash Pond

Job ID: 240-157688-1

Client Sample ID: DUP-DEK-BAP

Lab Sample ID: 240-157688-5

Date Collected: 10/04/21 00:00

Matrix: Water

Date Received: 10/08/21 08:00

<u>Prep Type</u>	<u>Batch Type</u>	<u>Batch Method</u>	<u>Run</u>	<u>Dilution Factor</u>	<u>Batch Number</u>	<u>Prepared or Analyzed</u>	<u>Analyst</u>	<u>Lab</u>
Total/NA	Prep	PrecSep STD			531995	10/15/21 11:10	BMP	TAL SL
Total/NA	Analysis	903.0		1	535397	11/08/21 17:27	FLC	TAL SL
Total/NA	Prep	PrecSep_0			531998	10/15/21 11:44	BMP	TAL SL
Total/NA	Analysis	904.0		1	535390	11/08/21 13:12	JLP	TAL SL
Total/NA	Analysis	Ra226_Ra228		1	537496	11/18/21 22:40	EMH	TAL SL

Laboratory References:

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

Accreditation/Certification Summary

Client: TRC Environmental Corporation.
 Project/Site: Karn/Weadock CCR DEK Bottom Ash Pond

Job ID: 240-157688-1

Laboratory: Eurofins TestAmerica, St. Louis

All accreditations/certifications held by this laboratory are listed. Not all accreditations/certifications are applicable to this report.

Authority	Program	Identification Number	Expiration Date
Alaska (UST)	State	20-001	05-06-22
ANAB	Dept. of Defense ELAP	L2305	04-06-22
ANAB	Dept. of Energy	L2305.01	04-06-22
ANAB	ISO/IEC 17025	L2305	04-06-22
Arizona	State	AZ0813	12-08-21
California	Los Angeles County Sanitation Districts	10259	06-30-22
California	State	2886	06-30-21 *
Connecticut	State	PH-0241	03-31-23
Florida	NELAP	E87689	06-30-22
HI - RadChem Recognition	State	n/a	06-30-22
Illinois	NELAP	200023	11-30-22
Iowa	State	373	12-01-22
Kansas	NELAP	E-10236	10-31-22
Kentucky (DW)	State	KY90125	01-01-22
Kentucky (WW)	State	KY90125 (Permit KY0004049)	12-31-21
Louisiana	NELAP	04080	06-30-22
Louisiana (DW)	State	LA011	12-31-21
Maryland	State	310	09-30-22
MI - RadChem Recognition	State	9005	06-30-22
Missouri	State	780	06-30-22
Nevada	State	MO000542020-1	07-31-22
New Jersey	NELAP	MO002	06-30-22
New York	NELAP	11616	04-01-22
North Dakota	State	R-207	06-30-22
NRC	NRC	24-24817-01	12-31-22
Oklahoma	State	9997	08-31-22
Oregon	NELAP	4157	09-01-22
Pennsylvania	NELAP	68-00540	03-01-22
South Carolina	State	85002001	06-30-22
Texas	NELAP	T104704193	07-31-22
US Fish & Wildlife	US Federal Programs	058448	07-31-22
USDA	US Federal Programs	P330-17-00028	03-11-23
Utah	NELAP	MO000542021-14	08-01-22
Virginia	NELAP	10310	06-14-22
Washington	State	C592	08-30-22
West Virginia DEP	State	381	10-31-22

* Accreditation/Certification renewal pending - accreditation/certification considered valid.

0.5/0.6

Client Information Company: TRC Environmental Corporation. Address: 1540 Eisenhower Place City: Ann Arbor State, Zip: MI, 48108-7080 Phone: 734-971-7080(Tel) 734-971-9022(Fax) Email: JKrenz@trccompanies.com Project Name: Karn/Weadock CCR DEK Bottom Ash Pond Site:		Lab PM: Brooks, Kris M E-Mail: Kris.Brooks@Eurofinset.com Tracking No(s): 190 State of Origin:		COC No: 240-87196-29052.1 Page: Page 1 of 1 Job #:	
Due Date Requested: TAT Requested (days): Compliance Project: <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No PO #: TBD WO #: Project #: 24024154 SSOV#:		Analysis Requested			
Sample Identification		904.0 - Standard Target List 903.0, Ra226Ra228, GPC		Preservation Codes: A - HCl B - NaOH C - Zn Acetate D - Nitric Acid E - NaHSO4 F - MeOH G - Amchlor H - Ascorbic Acid I - Ice J - DI Water K - EDTA L - EDA Other:	
Sample Date 10-4-21 10-4-21 10-4-21 10-4-21 10-4-21	Sample Time 1337 1446 1139 1232 ---	Sample Type (C=Comp, G=grab) G G G G G	Matrix (W=water, S=solid, O=soil, BT=tissue, A=air) Water Water Water Water Water	Field Filtered Sample (Yes or No) N N N N N	Perform MS/MSD (Yes or No) N N N N N
Possible Hazard Identification <input checked="" type="checkbox"/> Non-Hazard <input type="checkbox"/> Flammable <input type="checkbox"/> Skin Irritant <input type="checkbox"/> Poison B <input type="checkbox"/> Unknown <input type="checkbox"/> Radiological		Special Instructions/Note: Total Number of containers: <input checked="" type="checkbox"/>			
Relinquished by: <i>Neil Farin</i> Relinquished by: <i>Neil Farin</i> Relinquished by:		Date: 10-7-21/1100 Date/Time: 10/7/21 1100 Date/Time: 10-8-21 8:00 Date/Time:		Relinquished by: <i>Neil Farin</i> Relinquished by: <i>Mandy Bue</i> Relinquished by:	
Custody Seals Intact: <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Custody Seal No.:		Cooler Temperature(s) °C and Other Remarks:			
Empty Kit Relinquished by:		Date:		Method of Shipment:	
Deliverable Requested: I, II, III, IV, Other (specify)		Return To Client <input type="checkbox"/> Disposal By Lab <input type="checkbox"/> Archive For _____ Months		Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)	
Special Instructions/QC Requirements:					



Eurofins TestAmerica Canton Sample Receipt Form/Narrative

Login # : 157688

Canton Facility

Client ITC Site Name _____ Cooler unpacked by: Mandy Ble
 Cooler Received on 10-8-21 Opened on 10-8-21
 FedEx: 1st Grd Exp UPS FAS Clipper Client Drop Off TestAmerica Courier Other

Receipt After-hours: Drop-off Date/Time **Storage Location**

TestAmerica Cooler # TA Foam Box Client Cooler Box Other _____
 Packing material used: Bubble Wrap Foam Plastic Bag None Other _____
 COOLANT: Wet Ice Blue Ice Dry Ice Water None

1. Cooler temperature upon receipt See Multiple Cooler Form
 IR GUN# IR-14 (CF +0.1 °C) Observed Cooler Temp. 0.5 °C Corrected Cooler Temp. 0.6 °C
 IR GUN #IR-15 (CF +0.2°C) Observed Cooler Temp. _____ °C Corrected Cooler Temp. _____ °C

2. Were tamper/custody seals on the outside of the cooler(s)? If Yes Quantity 1 Yes No
 -Were the seals on the outside of the cooler(s) signed & dated? Yes No NA
 -Were tamper/custody seals on the bottle(s) or bottle kits (LLHg/MeHg)? Yes No
 -Were tamper/custody seals intact and uncompromised? Yes No NA
3. Shippers' packing slip attached to the cooler(s)? Yes No
4. Did custody papers accompany the sample(s)? Yes No
5. Were the custody papers relinquished & signed in the appropriate place? Yes No
6. Was/were the person(s) who collected the samples clearly identified on the COC? Yes No
7. Did all bottles arrive in good condition (Unbroken)? Yes No
8. Could all bottle labels (ID/Date/Time) be reconciled with the COC? Yes No
9. For each sample, does the COC specify preservatives (Y/N), # of containers (Y/N), and sample type of grab/comp (Y/N)? Yes No
10. Were correct bottle(s) used for the test(s) indicated? Yes No
11. Sufficient quantity received to perform indicated analyses? Yes No
12. Are these work share samples and all listed on the COC? Yes No
13. Were all preserved sample(s) at the correct pH upon receipt? Yes No NA pH Strip Lot# HC157842
14. Were VOAs on the COC? Yes No
15. Were air bubbles >6 mm in any VOA vials? Yes No NA Larger than this.
16. Was a VOA trip blank present in the cooler(s)? Trip Blank Lot # _____ Yes No
17. Was a LL Hg or Me Hg trip blank present? Yes No

Tests that are not checked for pH by Receiving:

 VOAs
 Oil and Grease
 TOC

Contacted PM _____ Date _____ by _____ via Verbal Voice Mail Other

Concerning _____

18. CHAIN OF CUSTODY & SAMPLE DISCREPANCIES additional next page Samples processed by: _____

19. SAMPLE CONDITION

Sample(s) _____ were received after the recommended holding time had expired.
 Sample(s) _____ were received in a broken container.
 Sample(s) _____ were received with bubble >6 mm in diameter. (Notify PM)

20. SAMPLE PRESERVATION

Sample(s) dek-mw-15005 were further preserved in the laboratory.
 Time preserved: 9:45 Preservative(s) added/Lot number(s): 0000-275-007

VOA Sample Preservation - Date/Time VOAs Frozen: _____

Temperature readings: _____

<u>Client Sample ID</u>	<u>Lab ID</u>	<u>Container Type</u>	<u>Container</u>		<u>Preservative</u>	
			<u>pH</u>	<u>Temp</u>	<u>Added (mls)</u>	<u>Lot #</u>
DEK-MW-15002	240-157688-A-1	Plastic 1 liter - Nitric Acid	<2	_____	_____	_____
DEK-MW-15002	240-157688-B-1	Plastic 1 liter - Nitric Acid	<2	_____	_____	_____
DEK-MW-15004	240-157688-A-2	Plastic 1 liter - Nitric Acid	<2	_____	_____	_____
DEK-MW-15004	240-157688-B-2	Plastic 1 liter - Nitric Acid	<2	_____	_____	_____
DEK-MW-15005	240-157688-A-3	Plastic 1 liter - Nitric Acid	<2	_____	_____	_____
DEK-MW-15005	240-157688-B-3	Plastic 1 liter - Nitric Acid	<2	_____	_____	_____
DEK-MW-15006	240-157688-A-4	Plastic 1 liter - Nitric Acid	<2	_____	_____	_____
DEK-MW-15006	240-157688-B-4	Plastic 1 liter - Nitric Acid	<2	_____	_____	_____
DUP-DEK-BAP	240-157688-A-5	Plastic 1 liter - Nitric Acid	<2	_____	_____	_____
DUP-DEK-BAP	240-157688-B-5	Plastic 1 liter - Nitric Acid	<2	_____	_____	_____

- 1
- 2
- 3
- 4
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- 6
- 7
- 8
- 9
- 10
- 11
- 12
- 13
- 14

Chain of Custody Record



Client Information (Sub Contract Lab)		Lab PM	Carrier Tracking No(s)	COC No							
Client Contact: TestAmerica Laboratories, Inc. Address: 13715 Rider Trail North, Earth City, MO, 63045 Phone: 314-298-8566 (Tel) 314-298-8757 (Fax) Email: [Redacted]		Brooks, Kris M		240-143943.1							
Shipping/Receiving: Karn/Weadock CCR Groundwater Monitoring Project Name: [Redacted] Site: [Redacted]		E-Mail: Kris Brooks@Eurofinset.com	State of Origin: Michigan	Page: Page 1 of 1							
Due Date Requested: 11/8/2021 TAT Requested (days): [Redacted]		Job #: 240-157688-1 Preservation Codes: A - HCL M - Hexane B - NaOH N - None C - Zn Acetate O - AsNaO2 D - Nitric Acid P - Na2OAS E - NaHSO4 Q - Na2SO3 F - MeOH R - Na2S2O3 G - Anchlor S - H2SO4 H - Ascorbic Acid T - TSP Dodecahydrate I - Ice U - Acetone J - DI Water V - MCAA K - EDTA W - pH 4.5 L - EDA Z - other (specify) Other:									
Sample ID (Lab ID)	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=water/oil, BT=BIOSUB, A=ALP)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	903.0/PreSep STD Standard Target List	904.0/PreSep STD Standard Target List	Ra226Ra228_GFPc	Total Number of Containers	Special Instructions/Note:
DEK-MW-15002 (240-157688-1)	10/4/21	13:37 Eastern	Water	Water	X	X	X	X	X	2	TVA protocol - Ra-226+228 action limit at 5.0 pCi/L
DEK-MW-15004 (240-157688-2)	10/4/21	14:46 Eastern	Water	Water	X	X	X	X	X	2	TVA protocol - Ra-226+228 action limit at 5.0 pCi/L
DEK-MW-15005 (240-157688-3)	10/4/21	11:39 Eastern	Water	Water	X	X	X	X	X	2	TVA protocol - Ra-226+228 action limit at 5.0 pCi/L
DEK-MW-15006 (240-157688-4)	10/4/21	12:32 Eastern	Water	Water	X	X	X	X	X	2	TVA protocol - Ra-226+228 action limit at 5.0 pCi/L
DUP-DEK-BAP (240-157688-5)	10/4/21	Eastern	Water	Water	X	X	X	X	X	2	TVA protocol - Ra-226+228 action limit at 5.0 pCi/L
<p>Note: Since laboratory accreditations are subject to change, Eurofins TestAmerica places the ownership of method, analyte & accreditation compliance upon our subcontract laboratories. This sample shipment is forwarded under chain-of-custody. If the laboratory does not currently maintain accreditation in the State of Origin listed above for analysis/matrix being analyzed, the samples must be shipped back to the Eurofins TestAmerica laboratory or other instructions will be provided. Any changes to accreditation status should be brought to Eurofins TestAmerica attention immediately. If all requested accreditations are current to date, return the signed Chain of Custody attesting to said compliance to Eurofins TestAmerica.</p>											
<p>Possible Hazard Identification</p> Unconfirmed Deliverable Requested: I, II, III, IV, Other (specify) Primary Deliverable Rank: 2 Empty Kit Relinquished by: [Redacted] Date: [Redacted] Relinquished by: [Redacted] Date: 10-8-21 1545 Company: ETA Relinquished by: [Redacted] Date: [Redacted] Company: [Redacted] Relinquished by: [Redacted] Date: [Redacted] Company: [Redacted]											
Sample Disposal (A fee may be assessed if samples are retained longer than 1 month) <input type="checkbox"/> Return To Client <input type="checkbox"/> Disposal By Lab <input type="checkbox"/> Archive For _____ Months Special Instructions/QC Requirements:											
Received by: [Redacted] Date/Time: 10-8-21 1545 Received by: [Redacted] Date/Time: 10-11-2021 0815 Received by: [Redacted] Date/Time: [Redacted] Company: [Redacted]											
Cooler Temperature(s) °C and Other Remarks:											



Login Sample Receipt Checklist

Client: TRC Environmental Corporation.

Job Number: 240-157688-1

Login Number: 157688

List Number: 2

Creator: Johnson, Autumn R

List Source: Eurofins TestAmerica, St. Louis

List Creation: 10/11/21 04:16 PM

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

ANALYTICAL REPORT

Eurofins TestAmerica, Canton
4101 Shuffel Street NW
North Canton, OH 44720
Tel: (330)497-9396

Laboratory Job ID: 240-157754-1

Client Project/Site: Karn/Weadock CCR Bottom ash Pond

For:

TRC Environmental Corporation.
1540 Eisenhower Place
Ann Arbor, Michigan 48108-7080

Attn: Darby Litz



*Authorized for release by:
11/19/2021 8:15:10 PM*

Kris Brooks, Project Manager II
(330)966-9790
Kris.Brooks@Eurofinset.com

LINKS

Review your project
results through
TotalAccess

Have a Question?



Visit us at:

www.eurofinsus.com/Env

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

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



Table of Contents

Cover Page	1
Table of Contents	2
Definitions/Glossary	3
Case Narrative	4
Method Summary	5
Sample Summary	6
Client Sample Results	7
Tracer Carrier Summary	9
QC Sample Results	10
QC Association Summary	12
Lab Chronicle	13
Certification Summary	14
Chain of Custody	15
Receipt Checklists	20

Definitions/Glossary

Client: TRC Environmental Corporation.
Project/Site: Karn/Weadock CCR Bottom ash Pond

Job ID: 240-157754-1

Qualifiers

Rad

Qualifier	Qualifier Description
*	LCS or LCSD is outside acceptance limits.
U	Result is less than the sample detection limit.

Glossary

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

Case Narrative

Client: TRC Environmental Corporation.
Project/Site: Karn/Weadock CCR Bottom ash Pond

Job ID: 240-157754-1

Job ID: 240-157754-1

Laboratory: Eurofins TestAmerica, Canton

Narrative

Job Narrative 240-157754-1

Comments

The EPA Method 903.0 Radium-226, EPA Method 904.0 Radium-228, and Ra226_Ra228 Combined Radium 226 and Radium 228 analyses were performed at the Eurofins TestAmerica St. Louis laboratory.

Receipt

The samples were received on 10/9/2021 10:10 AM. Unless otherwise noted below, the samples arrived in good condition, and where required, properly preserved and on ice. The temperatures of the 3 coolers at receipt time were 1.9° C, 2.5° C and 3.1° C.

RAD

Method 903.0: Radium 226 batch 531995

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

Radiochemistry sample results are reported with the count date/time applied as the Activity Reference Date. DEK-MW-15003 (240-157754-1), DEK-MW-18001 (240-157754-2), (LCS 160-531995/1-A), (LCSD 160-531995/2-A) and (MB 160-531995/20-A)

Method 904.0: Radium 228 batch 531998

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

Radiochemistry sample results are reported with the count date/time applied as the Activity Reference Date. DEK-MW-15003 (240-157754-1), DEK-MW-18001 (240-157754-2), (LCS 160-531998/1-A), (LCSD 160-531998/2-A) and (MB 160-531998/20-A)

Method PrecSep_0: Radium-228 Prep Batch 160-531998

The following samples were prepared at a reduced aliquot due to Matrix: DEK-MW-15003 (240-157754-1) and DEK-MW-18001 (240-157754-2). A laboratory control sample/ laboratory control sample duplicate (LCS/LCSD) were prepared instead of a sample duplicate (DUP) to demonstrate batch precision.

Method PrecSep STD: Radium-226 Prep Batch 160-536042

The following samples were prepared at a reduced aliquot due to Matrix: DEK-MW-15003 (240-157754-1) and DEK-MW-18001 (240-157754-2). A laboratory control sample/ laboratory control sample duplicate (LCS/LCSD) were prepared instead of a sample duplicate (DUP) to demonstrate batch precision.

Method PrecSep STD: 160-531995

The following samples were prepared at a reduced aliquot due to Matrix: DEK-MW-15003 (240-157754-1). As a result a laboratory control sample/ laboratory control sample duplicate (LCS/LCSD) were prepared instead of a sample duplicate (DUP) to demonstrate batch precision. DEK-MW-15003 (240-157754-1)

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

Method Summary

Client: TRC Environmental Corporation.
Project/Site: Karn/Weadock CCR Bottom ash Pond

Job ID: 240-157754-1

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

Protocol References:

EPA = US Environmental Protection Agency

None = None

TAL-STL = TestAmerica Laboratories, St. Louis, Facility Standard Operating Procedure.

Laboratory References:

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

Sample Summary

Client: TRC Environmental Corporation.
Project/Site: Karn/Weadock CCR Bottom ash Pond

Job ID: 240-157754-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
240-157754-1	DEK-MW-15003	Water	10/07/21 07:27	10/09/21 10:10
240-157754-2	DEK-MW-18001	Water	10/07/21 06:32	10/09/21 10:10

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Client Sample Results

Client: TRC Environmental Corporation.
 Project/Site: Karn/Weadock CCR Bottom ash Pond

Job ID: 240-157754-1

Client Sample ID: DEK-MW-15003

Lab Sample ID: 240-157754-1

Date Collected: 10/07/21 07:27

Matrix: Water

Date Received: 10/09/21 10:10

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.838		0.381	0.389	1.00	0.469	pCi/L	10/15/21 11:10	11/08/21 17:32	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	103		40 - 110					10/15/21 11:10	11/08/21 17:32	1

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.194	U	0.278	0.279	1.00	0.466	pCi/L	10/15/21 11:44	11/08/21 13:15	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	103		40 - 110					10/15/21 11:44	11/08/21 13:15	1
Y Carrier	84.5		40 - 110					10/15/21 11:44	11/08/21 13:15	1

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

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	1.03		0.472	0.479	5.00	0.469	pCi/L		11/18/21 22:40	1

Client Sample Results

Client: TRC Environmental Corporation.
 Project/Site: Karn/Weadock CCR Bottom ash Pond

Job ID: 240-157754-1

Client Sample ID: DEK-MW-18001

Lab Sample ID: 240-157754-2

Date Collected: 10/07/21 06:32

Matrix: Water

Date Received: 10/09/21 10:10

Method: 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.873		0.417	0.424	1.00	0.533	pCi/L	10/15/21 11:10	11/08/21 17:32	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	109		40 - 110					10/15/21 11:10	11/08/21 17:32	1

Method: 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.979	*	0.366	0.377	1.00	0.498	pCi/L	10/15/21 11:44	11/08/21 13:16	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	109		40 - 110					10/15/21 11:44	11/08/21 13:16	1
Y Carrier	73.6		40 - 110					10/15/21 11:44	11/08/21 13:16	1

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

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	1.85		0.555	0.567	5.00	0.533	pCi/L		11/18/21 22:40	1

Tracer/Carrier Summary

Client: TRC Environmental Corporation.
Project/Site: Karn/Weadock CCR Bottom ash Pond

Job ID: 240-157754-1

Method: 903.0 - Radium-226 (GFPC)

Matrix: Water

Prep Type: Total/NA

		Percent Yield (Acceptance Limits)	
Lab Sample ID	Client Sample ID	Ba (40-110)	
240-157754-1	DEK-MW-15003	103	
240-157754-2	DEK-MW-18001	109	
LCS 160-531995/1-A	Lab Control Sample	96.4	
LCS D 160-531995/2-A	Lab Control Sample Dup	90.4	
MB 160-531995/20-A	Method Blank	82.4	

Tracer/Carrier Legend

Ba = Ba Carrier

Method: 904.0 - Radium-228 (GFPC)

Matrix: Water

Prep Type: Total/NA

		Percent Yield (Acceptance Limits)	
Lab Sample ID	Client Sample ID	Ba (40-110)	Y (40-110)
240-157754-1	DEK-MW-15003	103	84.5
240-157754-2	DEK-MW-18001	109	73.6
LCS 160-531998/1-A	Lab Control Sample	96.4	60.2
LCS D 160-531998/2-A	Lab Control Sample Dup	90.4	84.9
MB 160-531998/20-A	Method Blank	82.4	89.0

Tracer/Carrier Legend

Ba = Ba Carrier

Y = Y Carrier

QC Sample Results

Client: TRC Environmental Corporation.
Project/Site: Karn/Weadock CCR Bottom ash Pond

Job ID: 240-157754-1

Method: 903.0 - Radium-226 (GFPC)

Lab Sample ID: MB 160-531995/20-A
Matrix: Water
Analysis Batch: 536236

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 531995

Analyte	MB	MB	Count	Total	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
	Result	Qualifier	Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Radium-226	-0.04114	U	0.120	0.120	1.00	0.258	pCi/L	10/15/21 11:10	11/12/21 10:22	1
Carrier	MB	MB	Limits			Prepared	Analyzed	Dil Fac		
	%Yield	Qualifier								
Ba Carrier	82.4		40 - 110			10/15/21 11:10	11/12/21 10:22	1		

Lab Sample ID: LCS 160-531995/1-A
Matrix: Water
Analysis Batch: 535397

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 531995

Analyte	Spike Added	LCS Result	LCS Qual	Total	RL	MDC	Unit	%Rec	%Rec. Limits
				Uncert. (2σ+/-)					
Radium-226	15.1	14.43		1.84	1.00	0.468	pCi/L	95	75 - 125
Carrier	LCS	LCS	Limits			Prepared	Analyzed	Dil Fac	
	%Yield	Qualifier							
Ba Carrier	96.4		40 - 110						

Lab Sample ID: LCSD 160-531995/2-A
Matrix: Water
Analysis Batch: 535397

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 531995

Analyte	Spike Added	LCSD Result	LCSD Qual	Total	RL	MDC	Unit	%Rec	%Rec. Limits	RER	Limit
				Uncert. (2σ+/-)							
Radium-226	15.1	12.63		1.71	1.00	0.582	pCi/L	84	75 - 125	0.51	1
Carrier	LCSD	LCSD	Limits			Prepared	Analyzed	Dil Fac			
	%Yield	Qualifier									
Ba Carrier	90.4		40 - 110								

Method: 904.0 - Radium-228 (GFPC)

Lab Sample ID: MB 160-531998/20-A
Matrix: Water
Analysis Batch: 535405

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 531998

Analyte	MB	MB	Count	Total	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
	Result	Qualifier	Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Radium-228	0.5019	U	0.341	0.344	1.00	0.526	pCi/L	10/15/21 11:44	11/08/21 13:16	1
Carrier	MB	MB	Limits			Prepared	Analyzed	Dil Fac		
	%Yield	Qualifier								
Ba Carrier	82.4		40 - 110			10/15/21 11:44	11/08/21 13:16	1		
Y Carrier	89.0		40 - 110			10/15/21 11:44	11/08/21 13:16	1		

QC Sample Results

Client: TRC Environmental Corporation.
 Project/Site: Karn/Weadock CCR Bottom ash Pond

Job ID: 240-157754-1

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

Lab Sample ID: LCS 160-531998/1-A
Matrix: Water
Analysis Batch: 535393

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 531998

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits	
									75	125
Radium-228	12.2	15.51		1.85	1.00	0.733	pCi/L	127	75	125
LCS LCS										
Carrier	%Yield	Qualifier	Limits							
Ba Carrier	96.4		40 - 110							
Y Carrier	60.2		40 - 110							

Lab Sample ID: LCSD 160-531998/2-A
Matrix: Water
Analysis Batch: 535393

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 531998

Analyte	Spike Added	LCSD Result	LCSD Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits		RER	Limit
									75	125	0.51	1
Radium-228	12.2	13.75		1.59	1.00	0.509	pCi/L	112	75	125	0.51	1
LCSD LCSD												
Carrier	%Yield	Qualifier	Limits									
Ba Carrier	90.4		40 - 110									
Y Carrier	84.9		40 - 110									

QC Association Summary

Client: TRC Environmental Corporation.
Project/Site: Karn/Weadock CCR Bottom ash Pond

Job ID: 240-157754-1

Rad

Prep Batch: 531995

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-157754-1	DEK-MW-15003	Total/NA	Water	PrecSep STD	
240-157754-2	DEK-MW-18001	Total/NA	Water	PrecSep STD	
MB 160-531995/20-A	Method Blank	Total/NA	Water	PrecSep STD	
LCS 160-531995/1-A	Lab Control Sample	Total/NA	Water	PrecSep STD	
LCSD 160-531995/2-A	Lab Control Sample Dup	Total/NA	Water	PrecSep STD	

Prep Batch: 531998

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-157754-1	DEK-MW-15003	Total/NA	Water	PrecSep_0	
240-157754-2	DEK-MW-18001	Total/NA	Water	PrecSep_0	
MB 160-531998/20-A	Method Blank	Total/NA	Water	PrecSep_0	
LCS 160-531998/1-A	Lab Control Sample	Total/NA	Water	PrecSep_0	
LCSD 160-531998/2-A	Lab Control Sample Dup	Total/NA	Water	PrecSep_0	

Lab Chronicle

Client: TRC Environmental Corporation.
Project/Site: Karn/Weadock CCR Bottom ash Pond

Job ID: 240-157754-1

Client Sample ID: DEK-MW-15003

Lab Sample ID: 240-157754-1

Date Collected: 10/07/21 07:27

Matrix: Water

Date Received: 10/09/21 10:10

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	PrecSep STD			531995	10/15/21 11:10	BMP	TAL SL
Total/NA	Analysis	903.0		1	535393	11/08/21 17:32	FLC	TAL SL
Total/NA	Prep	PrecSep_0			531998	10/15/21 11:44	BMP	TAL SL
Total/NA	Analysis	904.0		1	535405	11/08/21 13:15	FLC	TAL SL
Total/NA	Analysis	Ra226_Ra228		1	537496	11/18/21 22:40	EMH	TAL SL

Client Sample ID: DEK-MW-18001

Lab Sample ID: 240-157754-2

Date Collected: 10/07/21 06:32

Matrix: Water

Date Received: 10/09/21 10:10

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	PrecSep STD			531995	10/15/21 11:10	BMP	TAL SL
Total/NA	Analysis	903.0		1	535393	11/08/21 17:32	FLC	TAL SL
Total/NA	Prep	PrecSep_0			531998	10/15/21 11:44	BMP	TAL SL
Total/NA	Analysis	904.0		1	535405	11/08/21 13:16	FLC	TAL SL
Total/NA	Analysis	Ra226_Ra228		1	537496	11/18/21 22:40	EMH	TAL SL

Laboratory References:

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

Accreditation/Certification Summary

Client: TRC Environmental Corporation.
 Project/Site: Karn/Weadock CCR Bottom ash Pond


Job ID: 240-157754-1

Laboratory: Eurofins TestAmerica, St. Louis

All accreditations/certifications held by this laboratory are listed. Not all accreditations/certifications are applicable to this report.

Authority	Program	Identification Number	Expiration Date
Alaska (UST)	State	20-001	05-06-22
ANAB	Dept. of Defense ELAP	L2305	04-06-22
ANAB	Dept. of Energy	L2305.01	04-06-22
ANAB	ISO/IEC 17025	L2305	04-06-22
Arizona	State	AZ0813	12-08-21
California	Los Angeles County Sanitation Districts	10259	06-30-22
California	State	2886	06-30-21 *
Connecticut	State	PH-0241	03-31-23
Florida	NELAP	E87689	06-30-22
HI - RadChem Recognition	State	n/a	06-30-22
Illinois	NELAP	200023	11-30-22
Iowa	State	373	12-01-22
Kansas	NELAP	E-10236	10-31-22
Kentucky (DW)	State	KY90125	01-01-22
Kentucky (WW)	State	KY90125 (Permit KY0004049)	12-31-21
Louisiana	NELAP	04080	06-30-22
Louisiana (DW)	State	LA011	12-31-21
Maryland	State	310	09-30-22
MI - RadChem Recognition	State	9005	06-30-22
Missouri	State	780	06-30-22
Nevada	State	MO000542020-1	07-31-22
New Jersey	NELAP	MO002	06-30-22
New York	NELAP	11616	04-01-22
North Dakota	State	R-207	06-30-22
NRC	NRC	24-24817-01	12-31-22
Oklahoma	State	9997	08-31-22
Oregon	NELAP	4157	09-01-22
Pennsylvania	NELAP	68-00540	03-01-22
South Carolina	State	85002001	06-30-22
Texas	NELAP	T104704193	07-31-22
US Fish & Wildlife	US Federal Programs	058448	07-31-22
USDA	US Federal Programs	P330-17-00028	03-11-23
Utah	NELAP	MO000542021-14	08-01-22
Virginia	NELAP	10310	06-14-22
Washington	State	C592	08-30-22
West Virginia DEP	State	381	10-31-22

* Accreditation/Certification renewal pending - accreditation/certification considered valid.

Client Information		Sampler: <u>JASV JASV</u>		Lab P.M.: <u>Brooks, Kris M</u>		COC No.: <u>240-87197-29053.1</u>	
Client Contact: <u>Jacob Krenz</u>		Phone: <u>734 904 3710</u>		E-Mail: <u>Kris.Brooks@Eurofinset.com</u>		Page: <u>1 of 1</u>	
Company: <u>TRC Environmental Corporation.</u>		PWSID:		State of Origin:		Job #:	
Address: <u>1540 Eisenhower Place</u>		City: <u>Ann Arbor</u>		Due Date Requested:		Analysis Requested:	
State, Zip: <u>MI, 48108-7080</u>		Compliance Project: <u>Yes</u> <input type="checkbox"/> <u>No</u> <input type="checkbox"/>		TAT Requested (days):		Preservation Codes:	
Phone: <u>734-971-7080(Tel) 734-971-9022(Fax)</u>		PO #: <u>TBD</u>		Field Filtered Sample (Yes or No) <input checked="" type="checkbox"/> <u>Yes</u> <input type="checkbox"/> <u>No</u>		M - Hexane N - None O - AsNaO2 P - Na2O4S Q - Na2SO3 R - Na2SO4 S - H2SO4 T - TSP Dodecahydrate U - Ice V - MCAA W - pH 4-5 X - EDTA Y - EDA Z - other (specify)	
Email: <u>JKrenz@trccompanies.com</u>		WO #:		Form MSMSD (Yes or No) <input checked="" type="checkbox"/> <u>Yes</u> <input type="checkbox"/> <u>No</u>		Other:	
Project Name: <u>Karm/Weadock CCR DEK Bottom Ash Pond & I</u>		Project #: <u>24024154</u>		904.0 - Standard Target List		Special Instructions/Note:	
Site:		SSOW#:		903.0, Ra226Ra228, GFPC		Total Number of Containers: <u>3</u>	
Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix (W=water, S=solid, O=soil, BI=tissue, A=air)	Preservation Code:	Field Filtered Sample (Yes or No)	Form MSMSD (Yes or No)
DEK-MW-15003	<u>10/7/21</u>	<u>077</u>		Water		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
DEK-MW-18001	<u>10/7/21</u>	<u>087</u>	<u>G</u>	Water		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
DEK-MW-18001	10/7/21	087	C	Water		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
 240-157754 Chain of Custody							
Possible Hazard Identification <input type="checkbox"/> Non-Hazard <input type="checkbox"/> Flammable <input type="checkbox"/> Skin Irritant <input type="checkbox"/> Poison B <input checked="" type="checkbox"/> Unknown <input type="checkbox"/> Radiological							
Deliverable Requested: I, II, III, IV, Other (specify)							
Empty Kit Relinquished by: _____ Date: _____ Relinquished by: <u>JK</u> Date: <u>10/7/21 1700</u> Company: <u>TRC</u> Relinquished by: _____ Date: <u>10/8/21 1152</u> Company: <u>TRC</u> Relinquished by: _____ Date: <u>10/8/21 1345</u> Company: <u>GTA</u> Custody Seal No.: _____ Cooler Temperature(s) °C and Other Remarks: _____							
Sample Disposal (A fee may be assessed if samples are retained longer than 1 month) <input type="checkbox"/> Return To Client <input checked="" type="checkbox"/> Disposal By Lab <input type="checkbox"/> Archive For _____ Months Special Instructions/QC Requirements: _____							

Eurofins TestAmerica Canton Sample Receipt Form/Narrative
Canton Facility


Login # : _____

Client TRC Site Name _____
Cooler Received on 10/9/21 Opened on 10/9/21
FedEx: 1st Grd ~~UPS~~ UPS FAS Clipper Client Drop Off TestAmerica Courier Other _____

Cooler unpacked by:
Treit

Receipt After-hours: Drop-off Date/Time TC 10/9-21 Storage Location _____

TestAmerica Cooler # 743 Foam Box _____ Client Cooler _____ Box _____ Other _____
Packing material used: Bubble Wrap Foam Plastic Bag None Other _____
COOLANT: Wet Ice Blue Ice Dry Ice Water None _____

1. Cooler temperature upon receipt See Multiple Cooler Form
IR GUN# IR-14 (CF +0.1 °C) Observed Cooler Temp. _____ °C Corrected Cooler Temp. _____ °C
IR GUN #IR-15 (CF +0.2°C) Observed Cooler Temp. _____ °C Corrected Cooler Temp. _____ °C
2. Were tamper/custody seals on the outside of the cooler(s)? If Yes Quantity 1 Yes No
-Were the seals on the outside of the cooler(s) signed & dated? Yes No NA
-Were tamper/custody seals on the bottle(s) or bottle kits (LLHg/MeHg)? Yes No
-Were tamper/custody seals intact and uncompromised? Yes No NA
3. Shippers' packing slip attached to the cooler(s)? Yes No
4. Did custody papers accompany the sample(s)? Yes No No
5. Were the custody papers relinquished & signed in the appropriate place? Yes No No
6. Was/were the person(s) who collected the samples clearly identified on the COC? Yes No No
7. Did all bottles arrive in good condition (Unbroken)? Yes No No
8. Could all bottle labels (ID/Date/Time) be reconciled with the COC? Yes No No
9. For each sample, does the COC specify preservatives (Y/N), # of containers (Y/N), and sample type of grab/comp (Y/N)?
10. Were correct bottle(s) used for the test(s) indicated? Yes No No
11. Sufficient quantity received to perform indicated analyses? Yes No No
12. Are these work share samples and all listed on the COC? Yes No
If yes, Questions 13-17 have been checked at the originating laboratory.
13. Were all preserved sample(s) at the correct pH upon receipt? Yes No NA pH Strip Lot# HC157842
14. Were VOAs on the COC? Yes No
15. Were air bubbles >6 mm in any VOA vials?  ← Larger than this. Yes No NA
16. Was a VOA trip blank present in the cooler(s)? Trip Blank Lot # _____ Yes No
17. Was a LL Hg or Me Hg trip blank present? Yes No

Tests that are not checked for pH by Receiving:
VOAs
Oil and Grease
TOC

Contacted PM _____ Date _____ by _____ via Verbal Voice Mail Other _____

Concerning _____

18. CHAIN OF CUSTODY & SAMPLE DISCREPANCIES additional next page

Samples processed by: _____

19. SAMPLE CONDITION

Sample(s) _____ were received after the recommended holding time had expired.
Sample(s) _____ were received in a broken container.
Sample(s) _____ were received with bubble >6 mm in diameter. (Notify PM)

20. SAMPLE PRESERVATION

Sample(s) _____ were further preserved in the laboratory.
Time preserved: _____ Preservative(s) added/Lot number(s): _____

VOA Sample Preservation - Date/Time VOAs Frozen: _____

Temperature readings: _____

<u>Client Sample ID</u>	<u>Lab ID</u>	<u>Container Type</u>	<u>Container</u>		<u>Preservative</u>	
			<u>pH</u>	<u>Temp</u>	<u>Added (mls)</u>	<u>Lot #</u>
DEK-MW-15003	240-157754-A-1	Plastic 1 liter - Nitric Acid	<2	_____	_____	_____
DEK-MW-15003	240-157754-B-1	Plastic 1 liter - Nitric Acid	<2	_____	_____	_____
DEK-MW-18001	240-157754-A-2	Plastic 1 liter - Nitric Acid	<2	_____	_____	_____
DEK-MW-18001	240-157754-B-2	Plastic 1 liter - Nitric Acid	<2	_____	_____	_____

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10
- 11
- 12
- 13
- 14

Login Sample Receipt Checklist

Client: TRC Environmental Corporation.

Job Number: 240-157754-1

Login Number: 157754

List Number: 2

Creator: Korrinhizer, Micha L

List Source: Eurofins TestAmerica, St. Louis

List Creation: 10/12/21 05:17 PM

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

Technical Memorandum

Date: January 28, 2022

To: J.R. Register, Consumers Energy

From: Darby Litz, TRC
Kristin Lowery, TRC

Project No.: 418425.0001.0000 Phase 2 Task 2

Subject: Second Semiannual 2021 Nature and Extent Data Summary, DE Karn Bottom Ash Pond, Consumers Energy, Essexville, Michigan

In response to the United States Environmental Protection Agency's (U.S. EPA's) Resource Conservation and Recovery Act (RCRA) Coal Combustion Residual rule ("CCR Rule") promulgated on April 17, 2015, as amended, Consumers Energy Company (Consumers Energy) has conducted groundwater monitoring at the DE Karn Bottom Ash Pond CCR Unit. During the statistical evaluation of the initial assessment monitoring event (May 2018) for the Karn Bottom Ash Pond, arsenic was present in one or more downgradient monitoring well(s) at statistically significant levels exceeding the Groundwater Protection Standards (GWPSs)¹.

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

Per §257.95(g)(1), in the event that the facility determines, pursuant to §257.93(h), that there is a statistical exceedance of the GWPSs for one or more of the Appendix IV constituents, the facility must characterize the nature and extent of the release of CCR as well as any site conditions that may affect the remedy selected. Installation of additional monitoring wells at locations downgradient of the Karn Bottom Ash Pond groundwater monitoring system was not necessary or feasible due to the presence of existing monitoring wells sampled under the groundwater surface water interface (GSI) Compliance Monitoring Program administered under a Michigan-approved Hydrogeological Monitoring Plan (Consumers Energy, 2019), and the proximity of the surface water bodies. Monitoring wells designated for nature and extent characterization are shown on Figures 1 and 2 and data collected over the past year (March through October 2021) from these nature and extent groundwater monitoring wells are included in Tables 1 and 2.

¹ TRC. 2019. *Statistical Evaluation of Initial Assessment Monitoring Sampling Event, DE Karn Bottom Ash Pond, Consumers Energy Company, Essexville, Michigan*. January 14.

Technical Memorandum

Given the proximity of the Karn Bottom Ash Pond to the Karn Landfill at the Karn property, the nature and extent of contamination was assessed from a site-wide perspective rather than on a per CCR unit basis. The nature and extent of groundwater impacted by a release from the Karn Bottom Ash Pond overlaps with groundwater impacted by operation of the Karn Landfill. Additionally, looking at impacted groundwater on a site-wide basis was more practical from a risk mitigation standpoint, given:

- the likely age of the release(s);
- a long operational history of ash management
- the historical use of CCR as fill; and
- The influence of geochemistry on several of the Appendix IV constituent concentrations in groundwater.

As discussed in the ACM, the nature and extent of contamination (e.g. arsenic) in groundwater relative to GWPSs has been defined per the RCRA CCR Rule requirements based on the site-specific hydrogeology. Although arsenic concentrations exceed the GWPS in on-site groundwater monitoring locations, arsenic is 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 Karn Bottom Ash Pond. The property is owned and operated by Consumers Energy and groundwater is not used for drinking water. There are no on-site drinking water wells and there are no surface water potable water intakes within 3 miles of the site, so the drinking water pathway is not complete.

The distribution of arsenic relative to the Karn Bottom Ash Pond groundwater monitoring system in the shallow water-bearing unit as compared to the GWPS is presented in Figure 1. Three categories were assigned to groundwater data collected from March to October 2021, as follows:

- White – No Exceedances: all concentrations were below the GWPS
- Yellow – Two or More Exceedances: individual observations above the GWPS²
- Orange – Statistically Significant GWPS Exceedances³

The highest concentrations of arsenic observed in the vicinity of the Karn Bottom Ash Pond have been observed at DEK MW-15003, a monitoring well located to the north of the bottom ash pond and associated with the shifted “highest” elevation of mounded groundwater relative to the Karn Bottom Ash Pond. Although historically the point source discharge of sluiced bottom ash into the Karn Bottom Ash Pond created localized mounding of the potentiometric surface, the new Karn Lined Impoundment went into service on June 7, 2018 and has been continuously collecting the process water and bottom ash that went into the former bottom ash pond. Since the former bottom ash pond is no longer being hydraulically loaded with sluiced ash and has been dewatered by gravity, the characteristic

² Although an exceedance is defined as a single detection above the GWPS, confidence intervals will be used to determine compliance per the CCR Rule using the Karn Bottom Ash Pond monitoring well network. 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).

³ Lower confidence limit is above the GWPS based upon most recent assessment monitoring statistical evaluation using the most recent eight sampling events (May 2018 through October 2021).

Technical Memorandum

groundwater mound centered within the pooled area is no longer present. The groundwater elevation data collected from the groundwater monitoring system of the former bottom ash pond in October 2021 demonstrate a reduction in groundwater elevation measurements by several feet when compared to groundwater elevations measured prior to June 2018. Given this shift in groundwater flow direction, DEK-MW-15003 and DEK-MW-15004 are now located upgradient to side gradient of the CCR unit and are no longer representative of groundwater chemistry downgradient of the Karn Bottom Ash Pond. DEK-MW-15003 and DEK-MW-15004 cannot reliably be used to assess the effectiveness of the CCR removal activities and are influenced by the long operational history of ash management in this area of the site.

Recent data show that groundwater quality is improving for select constituents (e.g., downward trends in arsenic concentrations) since sluicing to the Karn Bottom Ash Pond ceased in June 2018 when the bottom ash and transport water was diverted to the Karn Lined Impoundment. Arsenic concentrations at DEK-MW-15002 and DEK-MW-18001 appear to exhibit a downward trend on the time-series chart (Attachment A). 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 showed that arsenic concentrations are generally decreasing with time, as evidenced by the negative Sen's Slope. The decreasing trend at DEK-MW-15002 was deemed statistically significant at the 98% confidence level. The trend at DEK-MW-18001 was not deemed to be statistically significant at the 98% confidence level. Groundwater chemistry appears to be improving as a result of discontinuing the hydraulic loading to the Karn Bottom Ash Pond and the completed source removal of CCR, as shown by the decreasing concentrations of arsenic at DEK-MW-15002 and DEK-MW-18001; however, attainment of the GWPS at all of the Bottom Ash Pond downgradient monitoring wells may not be feasible due to influences other than the former pond, such as the presence and former operation of the nearby Karn Landfill. Arsenic in the nature and extent monitoring wells located along the landfill perimeter bordering Saginaw Bay also exhibit concentrations above the GWPS. Although arsenic is present above the GWPS, the drinking water pathway is not complete as there are no drinking water wells on-site. Redox conditions, which affect contaminant transport, are still stabilizing in the Bottom Ash Pond Area following removal activities and will continue to be evaluated further.

Additionally, monitoring performed under the Michigan-approved GSI Compliance Monitoring Program demonstrates protection of human health and the environment with criteria determined to be protective at the potential point of exposure. Transect/porewater GSI compliance sampling data collected quarterly show that biogeochemical conditions are contributing to the reduction of arsenic in groundwater as observed in arsenic concentrations in transect push-point samples located along the water's edge of Saginaw Bay are generally much lower than the arsenic concentrations observed in the perimeter dike wells. Compliance with water quality criteria is demonstrated on a quarterly basis by evaluating the total chronic loading based on the authorization for the mixing zone.

The distribution of arsenic in the shallow water-bearing unit as compared to the mixing zone GSI criteria is presented in Figure 2. Three categories were assigned to the data from March to October 2021⁴, as follows:

⁴ Given the dynamic nature of the groundwater surface water interactions, it is appropriate to look at a shorter timeframe for data analysis (one year).

Technical Memorandum

- White – No Exceedances: all concentrations were below the mixing zone GSI criteria
- Light Blue – Two consecutive exceedances of the chronic mixing zone GSI criterion
- Dark Blue – Two consecutive exceedances of the acute mixing zone GSI criterion

Groundwater monitoring locations along the DE Karn Intake Channel and boundary between the coal ash management areas and the power plant complex (DEK-MW-15002, DEK-MW-15005, DEK-MW-15006, and DEK-MW-18001) document contaminant concentrations of arsenic are less than the authorized Mixing Zone-Based Chronic Concentration of 100 ug/L, with the exception of T4-3GSI and T5-3GSI. Total chronic loading, calculated from concentrations observed in groundwater samples collected from push-point samplers advanced at locations T1-3GSI through T6-3GSI, remains below the chronic mixing zone GSI criterion, indicating current conditions are protective of the GSI pathway.

Attachments

- Table 1 Summary of Groundwater Sampling Results (Analytical): March to October 2021; DE Karn Nature and Extent Monitoring Wells
- Table 2 Summary of Groundwater Sampling Results (Analytical): March to October 2021; DE Karn Nature and Extent GSI Monitoring Locations
- Figure 1 Nature and Extent Summary: GWPS Exceedances
- Figure 2 Nature and Extent Summary: GSI Pathway Compliance

Attachment A Trend Evaluation

Tables

Table 1
 Summary of Groundwater Sampling Results (Analytical): March 2021 - October 2021
 DE Karn Nature and Extent Monitoring Wells
 Essexville, Michigan

Constituent	Unit	GWPS*	MI Residential**	MI Non-Residential**	MI GSI [^]	MI AMV***	MI FAV***	Chronic MZ ^{^^}	Acute MZ ^{^^}	Sample Location: Sample Date:				MW-03				MW-06			
										3/2/2021	5/3/2021	7/27/2021	10/4/2021	3/2/2021	5/4/2021	7/27/2021	10/4/2021	3/2/2021	5/4/2021	7/27/2021	10/4/2021
Appendix III																					
Boron	ug/L	NA	500	500	4,000	34,000	69,000	44,000	69,000	5,510	6,330	5,510	5,250	7,760	9,610	8,770	9,150	986	1,080	1,050	998
Calcium	mg/L	NA	NC	NC	500 ^{EE}	NC	NC	NC	NC	87.2	97.5	80.3	84.5	123	146	114	133	131	155	106	103
Chloride	mg/L	NA	250 ^E	250 ^E	50	320,000	640,000	NC	NC	84.5	81.8	86.8	95.7	72.8	70.9	74.2	72	11.7	11.4	22.1	17.9
Fluoride	ug/L	4,000	NC	NC	NC	9,800	20,000	NC	NC	--	--	--	--	--	--	--	--	--	--	--	--
Sulfate	mg/L	NA	250 ^E	250 ^E	500 ^{EE}	600,000	1,200,000	NC	NC	< 2	< 1	< 1	< 1	2.26	< 1	< 1	2.24	106	188	105	86.7
Total Dissolved Solids	mg/L	NA	500 ^E	500 ^E	500	NC	NC	NC	NC	--	--	--	--	--	--	--	--	--	--	--	--
pH, Field	su	NA	6.5 - 8.5 ^E	6.5 - 8.5 ^E	6.5 - 9.0	NC	NC	NC	NC	8.3	8.4	8.4	8.2	8.5	7.8	7.9	7.8	7.3	7.0	7.3	7.3
Appendix IV																					
Antimony	ug/L	6	6.0	6.0	2.0	1,100	2,300	NC	NC	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic	ug/L	21 ¹	10	10	10	340	680	100	680	11	10	8	8	3	5	3	4	158	127	186	207
Barium	ug/L	2,000	2,000	2,000	1,200	3,400	6,800	NC	NC	--	--	--	--	--	--	--	--	--	--	--	--
Beryllium	ug/L	4	4.0	4.0	33	300	600	NC	NC	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	ug/L	5	5.0	5.0	2.5	12	24	NC	NC	--	--	--	--	--	--	--	--	--	--	--	--
Chromium	ug/L	100	100	100	11	16	32	NC	NC	1	< 1	1	1	2	1	2	2	2	1	1	1
Cobalt	ug/L	15	40	100	100	370	740	NC	NC	--	--	--	--	--	--	--	--	--	--	--	--
Fluoride	ug/L	4,000	NC	NC	NC	9,800	20,000	NC	NC	--	--	--	--	--	--	--	--	--	--	--	--
Lead	ug/L	15	4.0	4.0	14	250	500	NC	NC	--	--	--	--	--	--	--	--	--	--	--	--
Lithium	ug/L	180	170	350	440	910	1,800	NC	NC	92	88	84	83	93	89	92	96	53	52	49	49
Mercury	ug/L	2	2.0	2.0	0.20 [#]	1.4	2.8	NC	NC	--	--	--	--	--	--	--	--	--	--	--	--
Molybdenum	ug/L	100	73	210	120	29,000	58,000	NC	NC	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	10	11
Radium-226/228	pci/L	5	NC	NC	NC	NC	NC	NC	NC	--	--	--	--	--	--	--	--	--	--	--	--
Selenium	ug/L	50	50	50	5.0	62	120	55	120	< 1	1	2	2	< 1	1	3	4	< 1	< 1	< 1	< 1
Thallium	ug/L	2	2.0	2.0	2.0	47	94	NC	NC	--	--	--	--	--	--	--	--	--	--	--	--
MI Part 115 Parameters																					
Iron	ug/L	NA	300 ^E	300 ^E	500,000 ^{EE}	NC	NC	NC	NC	128	110	136	227	64	164	149	222	1,500	2,060	1,560	1,490
Copper	ug/L	NA	1,000 ^E	1,000 ^E	20	33	66	NC	NC	--	--	--	--	--	--	--	--	--	--	--	--
Nickel	ug/L	NA	100	100	120	1,000	2,100	NC	NC	--	--	--	--	--	--	--	--	--	--	--	--
Silver	ug/L	NA	34	98	0.2	0.54	1.1	NC	NC	--	--	--	--	--	--	--	--	--	--	--	--
Vanadium	ug/L	NA	4.5	62	27	79	160	NC	NC	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2
Zinc	ug/L	NA	2,400	5,000 ^E	260	260	520	NC	NC	--	--	--	--	--	--	--	--	--	--	--	--

Notes:

- ug/L - micrograms per liter; mg/L - milligrams per liter.
- SU - standard units; pH is a field parameter.
- NA - not applicable.
- NC - no criteria.
- - not analyzed.
- * - GWPS (Groundwater Protection Standard) is the higher of the Maximum Contaminant Level (MCL)/Regional Screening Level from 83 FR 36435 (RSL) and Upper Tolerance Limit (UTL) as established in TRC's Technical Memorandum dated October 15, 2018.
- ** - Michigan Part 201 Generic Drinking Water Cleanup Criteria, December 21, 2020.
- [^] - 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}.
- *** - Aquatic Maximum (AMV) and Final Acute Values (FAV) are taken from EGLE Rule 323.1057 Part 4 - Water Quality Standards (Rule 57), March 15, 2018. Hardness-dependent criteria calculated using site-specific hardness of 258 mg CaCO3/L (average of SW-01 [Lake Huron] and SW-02 [Saginaw River] collected in April 2018). Chromium AMV & FAV criteria are based on hexavalent chromium.
- ^{^^} - Mixing Zone GSI Criteria from Michigan Department of Environmental Quality (MDEQ) approval letter dated December 23, 2015.
- [#] - 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}.
- ^H - Sample was analyzed out of hold time.

BOLD font denotes concentrations detected above laboratory reporting limits.

Result Indicates an exceedance of one or more applicable health-based drinking water and GSI criteria.
Result Indicates an exceedance of acute-based GSI criteria.

All metals were analyzed as total unless otherwise specified.

¹ - Constituent triggered an Assessment of Corrective Measures for the Karn Bottom Ash Pond as described in TRC's letter report dated January 14, 2019.

Table 1
 Summary of Groundwater Sampling Results (Analytical): March 2021 - October 2021
 DE Karn Nature and Extent Monitoring Wells
 Essexville, Michigan

Constituent	Unit	GWPS*	MI Residential**	MI Non-Residential**	MI GSI [^]	MI AMV***	MI FAV***	Chronic MZ ^{^^}	Acute MZ ^{^^}	Sample Location: MW-08				MW-10					
										Sample Date:	3/2/2021	5/4/2021	7/27/2021	10/4/2021	3/2/2021	3/23/2021	5/4/2021	7/27/2021	10/4/2021
Appendix III																			
Boron	ug/L	NA	500	500	4,000	34,000	69,000	44,000	69,000	4,230	5,020	4,130	4,700	3,900	3,940	4,900	5,210	5,130	
Calcium	mg/L	NA	NC	NC	500 ^{EE}	NC	NC	NC	NC	205	228	191	186	192	247	194	159	173	
Chloride	mg/L	NA	250 ^E	250 ^E	50	320,000	640,000	NC	NC	71.5	51.4	54.4	53.6	57.3	46.1	60.9	69.4	78.6	
Fluoride	ug/L	4,000	NC	NC	NC	9,800	20,000	NC	NC	--	--	--	--	--	--	--	--	--	
Sulfate	mg/L	NA	250 ^E	250 ^E	500 ^{EE}	600,000	1,200,000	NC	NC	327	360	333	270	191	368	111	54.9	91.2	
Total Dissolved Solids	mg/L	NA	500 ^E	500 ^E	500	NC	NC	NC	NC	--	--	--	--	--	--	--	--	--	
pH, Field	su	NA	6.5 - 8.5 ^E	6.5 - 8.5 ^E	6.5 - 9.0	NC	NC	NC	NC	7.1	7.1	7.1	7.1	7.3	7.0	7.3	7.3	7.2	
Appendix IV																			
Antimony	ug/L	6	6.0	6.0	2.0	1,100	2,300	NC	NC	--	--	--	--	--	--	--	--	--	
Arsenic	ug/L	21 ¹	10	10	10	340	680	100	680	97	91	84	104	610	431	724	589	1,040	
Barium	ug/L	2,000	2,000	2,000	1,200	3,400	6,800	NC	NC	--	--	--	--	--	--	--	--	--	
Beryllium	ug/L	4	4.0	4.0	33	300	600	NC	NC	--	--	--	--	--	--	--	--	--	
Cadmium	ug/L	5	5.0	5.0	2.5	12	24	NC	NC	--	--	--	--	--	--	--	--	--	
Chromium	ug/L	100	100	100	11	16	32	NC	NC	< 1	< 1	1	1	< 1	< 1	< 1	< 1	1	
Cobalt	ug/L	15	40	100	100	370	740	NC	NC	--	--	--	--	--	--	--	--	--	
Fluoride	ug/L	4,000	NC	NC	NC	9,800	20,000	NC	NC	--	--	--	--	--	--	--	--	--	
Lead	ug/L	15	4.0	4.0	14	250	500	NC	NC	--	--	--	--	--	--	--	--	--	
Lithium	ug/L	180	170	350	440	910	1,800	NC	NC	122	114	113	109	135	115	132	136	135	
Mercury	ug/L	2	2.0	2.0	0.20 [#]	1.4	2.8	NC	NC	--	--	--	--	--	--	--	--	--	
Molybdenum	ug/L	100	73	210	120	29,000	58,000	NC	NC	33	33	32	31	< 5	9	< 5	< 5	< 5	
Radium-226/228	pci/L	5	NC	NC	NC	NC	NC	NC	NC	--	--	--	--	--	--	--	--	--	
Selenium	ug/L	50	50	50	5.0	62	120	55	120	< 1	< 1	2	3	< 1	< 1	< 1	< 1	5	
Thallium	ug/L	2	2.0	2.0	2.0	47	94	NC	NC	--	--	--	--	--	--	--	--	--	
MI Part 115 Parameters																			
Iron	ug/L	NA	300 ^E	300 ^E	500,000 ^{EE}	NC	NC	NC	NC	7,030	7,060	9,150	9,650	3,990	6,460	3,140	2,780	5,990	
Copper	ug/L	NA	1,000 ^E	1,000 ^E	20	33	66	NC	NC	--	--	--	--	--	--	--	--	--	
Nickel	ug/L	NA	100	100	120	1,000	2,100	NC	NC	--	--	--	--	--	--	--	--	--	
Silver	ug/L	NA	34	98	0.2	0.54	1.1	NC	NC	--	--	--	--	--	--	--	--	--	
Vanadium	ug/L	NA	4.5	62	27	79	160	NC	NC	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	
Zinc	ug/L	NA	2,400	5,000 ^E	260	260	520	NC	NC	--	--	--	--	--	--	--	--	--	

Notes:

- ug/L - micrograms per liter; mg/L - milligrams per liter.
- SU - standard units; pH is a field parameter.
- NA - not applicable.
- NC - no criteria.
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- * - GWPS (Groundwater Protection Standard) is the higher of the Maximum Contaminant Level (MCL)/Regional Screening Level from 83 FR 36435 (RSL) and Upper Tolerance Limit (UTL) as established in TRC's Technical Memorandum dated October 15, 2018.
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- *** - Aquatic Maximum (AMV) and Final Acute Values (FAV) are taken from EGLE Rule 323.1057 Part 4 - Water Quality Standards (Rule 57), March 15, 2018. Hardness-dependent criteria calculated using site-specific hardness of 258 mg CaCO₃/L (average of SW-01 [Lake Huron] and SW-02 [Saginaw River] collected in April 2018). Chromium AMV & FAV criteria are based on hexavalent chromium.
- ^{^^} - Mixing Zone GSI Criteria from Michigan Department of Environmental Quality (MDEQ) approval letter dated December 23, 2015.
- [#] - 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).
- ^H - Sample was analyzed out of hold time.

BOLD font denotes concentrations detected above laboratory reporting limits.

Result	Indicates an exceedance of one or more applicable health-based drinking water and GSI criteria.
Result	Indicates an exceedance of acute-based GSI criteria.

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 DE Karn Nature and Extent Monitoring Wells
 Essexville, Michigan

Constituent	Unit	GWPS*	MI Residential**	MI Non-Residential**	MI GSI [^]	MI AMV***	MI FAV***	Chronic MZ ^{^^}	Acute MZ ^{^^}	Sample Location: MW-16				Sample Location: MW-22				Sample Location: MW-23			
										Sample Date: 3/2/2021	5/3/2021	7/27/2021	10/6/2021	3/3/2021	5/4/2021	7/28/2021	10/6/2021	3/4/2021	5/6/2021	7/28/2021	10/6/2021
Appendix III																					
Boron	ug/L	NA	500	500	4,000	34,000	69,000	44,000	69,000	1,300	1,190	891	1,310	6,570	7,220	6,900	6,800	6,840	7,500	6,620	7,030
Calcium	mg/L	NA	NC	NC	500 ^{EE}	NC	NC	NC	NC	338	365	243	304	74.4	86.9	69.7	77.6	164	179	147	150
Chloride	mg/L	NA	250 ^E	250 ^E	50	320,000	640,000	NC	NC	130	99.2	53.5	83.6	88.5	86.5	91.2	95.8	61.9	56.9	56.6	57.4
Fluoride	ug/L	4,000	NC	NC	NC	9,800	20,000	NC	NC	--	--	--	--	--	--	--	--	--	--	--	--
Sulfate	mg/L	NA	250 ^E	250 ^E	500 ^{EE}	600,000	1,200,000	NC	NC	972	1,020	607	968	164	169	169	172	196	189	208	199
Total Dissolved Solids	mg/L	NA	500 ^E	500 ^E	500	NC	NC	NC	NC	--	--	--	--	--	--	--	--	--	--	--	--
pH, Field	su	NA	6.5 - 8.5 ^E	6.5 - 8.5 ^E	6.5 - 9.0	NC	NC	NC	NC	7.3	7.2	7.3	7.1	9.1	8.5	7.5	6.6	7.1	6.8	6.8	6.9
Appendix IV																					
Antimony	ug/L	6	6.0	6.0	2.0	1,100	2,300	NC	NC	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic	ug/L	21 ¹	10	10	10	340	680	100	680	3	< 1	1	2	555	549	385	552	49	29	29	64
Barium	ug/L	2,000	2,000	2,000	1,200	3,400	6,800	NC	NC	--	--	--	--	--	--	--	--	--	--	--	--
Beryllium	ug/L	4	4.0	4.0	33	300	600	NC	NC	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	ug/L	5	5.0	5.0	2.5	12	24	NC	NC	--	--	--	--	--	--	--	--	--	--	--	--
Chromium	ug/L	100	100	100	11	16	32	NC	NC	< 1	< 1	< 1	1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	3
Cobalt	ug/L	15	40	100	100	370	740	NC	NC	--	--	--	--	--	--	--	--	--	--	--	--
Fluoride	ug/L	4,000	NC	NC	NC	9,800	20,000	NC	NC	--	--	--	--	--	--	--	--	--	--	--	--
Lead	ug/L	15	4.0	4.0	14	250	500	NC	NC	--	--	--	--	--	--	--	--	--	--	--	--
Lithium	ug/L	180	170	350	440	910	1,800	NC	NC	126	132	81	117	151	144	134	129	137	120	125	129
Mercury	ug/L	2	2.0	2.0	0.20 [#]	1.4	2.8	NC	NC	--	--	--	--	--	--	--	--	--	--	--	--
Molybdenum	ug/L	100	73	210	120	29,000	58,000	NC	NC	20	16	20	32	1,020	1,090	1,070	1,110	67	58	49	57
Radium-226/228	pci/L	5	NC	NC	NC	NC	NC	NC	NC	--	--	--	--	--	--	--	--	--	--	--	--
Selenium	ug/L	50	50	50	5.0	62	120	55	120	2	2	4	3	< 1	2	2	2	< 1	2	2	4
Thallium	ug/L	2	2.0	2.0	2.0	47	94	NC	NC	--	--	--	--	--	--	--	--	--	--	--	--
MI Part 115 Parameters																					
Iron	ug/L	NA	300 ^E	300 ^E	500,000 ^{EE}	NC	NC	NC	NC	535	151	302	331	49	93	< 20	162	19,200	11,700	20,700	30,600
Copper	ug/L	NA	1,000 ^E	1,000 ^E	20	33	66	NC	NC	--	--	--	--	--	--	--	--	--	--	--	--
Nickel	ug/L	NA	100	100	120	1,000	2,100	NC	NC	--	--	--	--	--	--	--	--	--	--	--	--
Silver	ug/L	NA	34	98	0.2	0.54	1.1	NC	NC	--	--	--	--	--	--	--	--	--	--	--	--
Vanadium	ug/L	NA	4.5	62	27	79	160	NC	NC	< 2	< 2	< 2	< 2	< 2	< 2	< 2	3	< 2	2	< 2	9
Zinc	ug/L	NA	2,400	5,000 ^E	260	260	520	NC	NC	--	--	--	--	--	--	--	--	--	--	--	--

Notes:
 ug/L - micrograms per liter; mg/L - milligrams per liter.
 SU - standard units; pH is a field parameter.
 NA - not applicable.
 NC - no criteria.
 -- - not analyzed.
 * - GWPS (Groundwater Protection Standard) is the higher of the Maximum Contaminant Level (MCL)/Regional Screening Level from 83 FR 36435 (RSL) and Upper Tolerance Limit (UTL) as established in TRC's Technical Memorandum dated October 15, 2018.
 ** - Michigan Part 201 Generic Drinking Water Cleanup Criteria, December 21, 2020.
 ^ - 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}.
 *** - Aquatic Maximum (AMV) and Final Acute Values (FAV) are taken from EGLE Rule 323.1057 Part 4 - Water Quality Standards (Rule 57), March 15, 2018. Hardness-dependent criteria calculated using site-specific hardness of 258 mg CaCO3/L (average of SW-01 [Lake Huron] and SW-02 [Saginaw River] collected in April 2018). Chromium AMV & FAV criteria are based on hexavalent chromium.
 ^^ - Mixing Zone GSI Criteria from Michigan Department of Environmental Quality (MDEQ) approval letter dated December 23, 2015.
 # - 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}.
 H - Sample was analyzed out of hold time.
BOLD font denotes concentrations detected above laboratory reporting limits.

Result	Indicates an exceedance of one or more applicable health-based drinking water and GSI criteria.
Result	Indicates an exceedance of acute-based GSI criteria.

All metals were analyzed as total unless otherwise specified.

¹ - Constituent triggered an Assessment of Corrective Measures for the Karn Bottom Ash Pond as described in TRC's letter report dated January 14, 2019.

Table 2
 Summary of Groundwater Sampling Results (Analytical): March 2021 - October 2021
 DE Karn Nature and Extent GSI Monitoring Locations
 Essexville, Michigan

Constituent	Unit	GWPS*	MI Residential**	MI Non-Residential**	MI GSI^	MI AMV***	MI FAV***	Chronic MZ^^	Acute MZ^^	Sample Location: Sample Date:				T1-3GSI				T2-3GSI				T3-3GSI			
										3/22/2021	5/5/2021	7/26/2021	10/5/2021	3/22/2021	5/5/2021	7/26/2021	10/5/2021	3/22/2021	5/5/2021	7/26/2021	10/5/2021	3/22/2021	5/5/2021	7/26/2021	10/5/2021
Appendix III																									
Boron	ug/L	NA	500	500	4,000	34,000	69,000	44,000	69,000	56	2,520	53	58	2,730	2,340	2,520	5,320	923	3,440	372	261				
Calcium	mg/L	NA	NC	NC	500 ^{EE}	NC	NC	NC	NC	76.2	195	52.1	52.4	188	176	214	262	141	327	115	82.6				
Chloride	mg/L	NA	250 ^E	250 ^E	50	320,000	640,000	NC	NC	46.5	36.3	54.2	41.4	20.4	23	3.81	66.8	29.3	62.8	50.5	37.3				
Sulfate	mg/L	NA	250 ^E	250 ^E	500 ^{EE}	600,000	1,200,000	NC	NC	37.3	< 1	24.8	24	261	141	66.8	30.3	< 2	< 1	< 1	< 1				
pH, Field	su	NA	6.5 - 8.5 ^E	6.5 - 8.5 ^E	6.5 - 9.0	NC	NC	NC	NC	7.4	7.1	7.8	8.0	7.0	7.0	6.8	7.0	6.6	6.9	7.1	6.8				
Appendix IV																									
Arsenic	ug/L	21 ¹	10	10	10	340	680	100 ²	680	3	18	3	2	8	12	12	18	18	1	65	34				
Chromium	ug/L	100	100	100	11	16	32	NC	NC	< 1	2	< 1	< 1	< 1	2	3	2	3	1	3	2				
Lithium	ug/L	180	170	350	440	910	1,800	NC	NC	< 10	37	< 10	< 10	83	96	110	136	56	128	16	11				
Molybdenum	ug/L	100	73	210	120	29,000	58,000	NC	NC	6	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5				
Selenium	ug/L	50	50	50	5.0	62	120	NC	NC	1	1	1	< 1	2	< 1	< 1	4	1	< 1	2	1				
MI Part 115 Parameters																									
Iron	ug/L	NA	300 ^E	300 ^E	500,000 ^{EE}	NC	NC	NC	NC	887	6,770	55	< 20	10,400	8,860	9,600	9,360	19,800	1,740	12,000	16,200				
Vanadium	ug/L	NA	4.5	62	27	260	520	NC	NC	< 2	< 2	< 2	< 2	< 2	< 2	< 2	2	< 2	2	3	< 2				

Notes:

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

SU - standard units; pH is a field parameter.

NA - not applicable.

NC - no criteria.

* - GWPS (Groundwater Protection Standard) is the higher of the Maximum Contaminant Level (MCL)/Regional Screening Level from 83 FR 36435 (RSL) and Upper Tolerance Limit (UTL) as established in TRC's Technical Memorandum dated October 15, 2018.

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

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*** - Aquatic Maximum (AMV) and Final Acute Values (FAV) are taken from EGLE Rule 323.1057 Part 4 - Water Quality Standards (Rule 57), March 15, 2018. Hardness-dependent criteria calculated using site-specific hardness of 258 mg CaCO3/L (average of SW-01 [Lake Huron] and SW-02 [Saginaw River] collected in April 2018). Chromium AMV & FAV criteria are based on hexavalent chromium.

^^ - Mixing Zone GSI Criteria from Michigan Department of Environmental Quality (MDEQ) approval letter dated December 23, 2015.

^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}.

BOLD font denotes concentrations detected above laboratory reporting limits.

Result Indicates an exceedance of one or more applicable health-based drinking water and GSI criteria.

Result Indicates an exceedance of acute-based GSI criteria.

All metals were analyzed as total unless otherwise specified.

¹ - Constituent triggered an Assessment of Corrective Measures for the Karn Bottom Ash Pond as described in TRC's letter report dated January 14, 2019.

² - Compliance demonstrated on a flux basis.

Table 2
 Summary of Groundwater Sampling Results (Analytical): March 2021 - October 2021
 DE Karn Nature and Extent GSI Monitoring Locations
 Essexville, Michigan

Constituent	Unit	GWPS*	MI Residential**	MI Non-Residential**	MI GSI [^]	MI AMV***	MI FAV***	Chronic MZ ^{^^}	Acute MZ ^{^^}	Sample Location: Sample Date:				T4-3GSI				T5-3GSI				T6-3GSI			
										3/22/2021	5/5/2021	7/26/2021	10/5/2021	3/22/2021	5/5/2021	7/27/2021	10/5/2021	3/23/2021	5/5/2021	7/27/2021	10/5/2021				
Appendix III																									
Boron	ug/L	NA	500	500	4,000	34,000	69,000	44,000	69,000	77	2,130	305	248	824	3,100	2,650	1,400	103	308	206	136				
Calcium	mg/L	NA	NC	NC	500 ^{EE}	NC	NC	NC	NC	109	167	112	133	254	279	278	69.6	199	400	132	321				
Chloride	mg/L	NA	250 ^E	250 ^E	50	320,000	640,000	NC	NC	44.2	45.1	46.8	67.9	74	74.3	80.5	40.7	51.6	53.6	33.4	49.4				
Sulfate	mg/L	NA	250 ^E	250 ^E	500 ^{EE}	600,000	1,200,000	NC	NC	26.8	< 1	< 1	< 1	296	337	452	9.72	< 2	731	3.42	882				
pH, Field	su	NA	6.5 - 8.5 ^E	6.5 - 8.5 ^E	6.5 - 9.0	NC	NC	NC	NC	7.4	7.0	7.3	7.1	7.3	7.1	7.0	7.4	6.6	6.4	6.4	6.9				
Appendix IV																									
Arsenic	ug/L	21 ¹	10	10	10	340	680	100 ²	680	18	145	128	141	76	202	501	482	2	11	4	2				
Chromium	ug/L	100	100	100	11	16	32	NC	NC	< 1	2	2	3	1	4	4	2	2	2	2	4				
Lithium	ug/L	180	170	350	440	910	1,800	NC	NC	< 10	53	23	25	41	60	92	53	15	29	25	16				
Molybdenum	ug/L	100	73	210	120	29,000	58,000	NC	NC	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5				
Selenium	ug/L	50	50	50	5.0	62	120	NC	NC	2	< 1	2	3	6	< 1	3	< 1	2	1	< 1	< 1				
MI Part 115 Parameters																									
Iron	ug/L	NA	300 ^E	300 ^E	500,000 ^{EE}	NC	NC	NC	NC	8,820	28,100	17,800	33,700	1,210	890	1,390	157	21,400	17,700	16,900	1,070				
Vanadium	ug/L	NA	4.5	62	27	260	520	NC	NC	< 2	< 2	2	< 2	< 2	2	4	< 2	3	< 2	2	2				

Notes:

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

SU - standard units; pH is a field parameter.

NA - not applicable.

NC - no criteria.

* - GWPS (Groundwater Protection Standard) is the higher of the Maximum Contaminant Level (MCL)/Regional Screening Level from 83 FR 36435 (RSL) and Upper Tolerance Limit (UTL) as established in TRC's Technical Memorandum dated October 15, 2018.

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

[^] - 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}.

*** - Aquatic Maximum (AMV) and Final Acute Values (FAV) are taken from EGLE Rule 323.1057 Part 4 - Water Quality Standards (Rule 57), March 15, 2018. Hardness-dependent criteria calculated using site-specific hardness of 258 mg CaCO₃/L (average of SW-01 [Lake Huron] and SW-02 [Saginaw River] collected in April 2018). Chromium AMV & FAV criteria are based on hexavalent chromium.

^{^^} - Mixing Zone GSI Criteria from Michigan Department of Environmental Quality (MDEQ) approval letter dated December 23, 2015.

^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}.

BOLD font denotes concentrations detected above laboratory reporting limits.

Result Indicates an exceedance of one or more applicable health-based drinking water and GSI criteria.

Result Indicates an exceedance of acute-based GSI criteria.

All metals were analyzed as total unless otherwise specified.

¹ - Constituent triggered an Assessment of Corrective Measures for the Karn Bottom Ash Pond as described in TRC's letter report dated January 14, 2019.

² - Compliance demonstrated on a flux basis.

Figures

Plot Date: 1/27/2022 09:25:50 AM by AFOUTIK - LAYOUT: ANSI B(11"x17")
 Path: S:\1-PROJECTS\Consumers Energy Company\Michigan\CCR_GW\2017_269767418426-Exceedances\NE_ACM_20211229.mxd
 Coordinate System: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl (Foot)
 TRC - GIS



Constituent	GWPS
Antimony	6 ug/L
Arsenic	21 ug/L
Barium	2,000 ug/L
Beryllium	4 ug/L
Cadmium	5 ug/L
Chromium	100 ug/L
Cobalt	15 ug/L
Fluoride	4,000 ug/L
Lead	15 ug/L
Lithium	180 ug/L
Mercury	2 ug/L
Molybdenum	100 ug/L
Radium-226/228	5 pCi/L
Selenium	50 ug/L
Thallium	2 ug/L

LEGEND

- DEK BOTTOM ASH POND MONITORING WELL
- DECOMMISSIONED MONITORING WELL
- NATURE AND EXTENT WELL
- NO EXCEEDANCES
- TWO OR MORE EXCEEDANCES (NOTES 4 + 5)
- STATISTICALLY SIGNIFICANT GWPS EXCEEDANCE (NOTE 6)
- SLURRY WALL (APPROXIMATE)
- LINED IMPOUNDMENT (COVENANT BOUNDARY)
- POREWATER SAMPLING AREA

* GWPS EXCEEDANCE TRIGGERED ASSESSMENT OF CORRECTIVE MEASURES PURSUANT TO §257.96

WELL ID
CONSTITUENT(S)
EXCEEDING GWPS

- NOTES**
- BASE MAP IMAGERY FROM GOOGLE EARTH PRO, 2018.
 - MONITORING WELL AND SLURRY WALL LOCATIONS PROVIDED BY CEC; SG21733SHT2 REV.B.DWG DATED 11/21/2018.
 - GWPS (GROUNDWATER PROTECTION STANDARD) IS THE HIGHER OF THE MAXIMUM CONTAMINANT LEVEL (MCL)/REGIONAL SCREENING LEVEL FROM 83 FR 36435 (RSL) AND UPPER TOLERANCE LIMIT (UTL) AS ESTABLISHED IN TRC'S TECHNICAL MEMORANDUM DATED OCTOBER 15, 2018.
 - GROUNDWATER DATA FROM MARCH TO OCTOBER 2021 ARE SCREENED AGAINST THE GWPS FOR EVALUATION PURPOSES ONLY. AN EXCEEDANCE IS DEFINED AS A SINGLE DETECTION ABOVE THE GWPS, HOWEVER, CONFIDENCE INTERVALS WILL BE USED TO DETERMINE COMPLIANCE PER THE CCR RULES.
 - AN EXCEEDANCE OF THE GWPS DOES NOT INDICATE UNACCEPTABLE RISK FROM GROUNDWATER EXPOSURE; THE DRINKING WATER PATHWAY IS NOT COMPLETE ON THE PROPERTY. GROUNDWATER CONDITIONS CONTINUE TO BE MONITORED TO INFORM THE DEK BOTTOM ASH POND REMEDY SELECTION.
 - LOWER CONFIDENCE LIMIT IS ABOVE GWPS.

PROJECT: **CONSUMERS ENERGY COMPANY
DE KARN POWER PLANT
ESSEXVILLE, MICHIGAN**

TITLE: **NATURE AND EXTENT SUMMARY
GWPS EXCEEDANCES**

DRAWN BY: A. FOJTIK	PROJ NO: 418425.0001
CHECKED BY: K. LOWERY	FIGURE 1
APPROVED BY: D.LITZ	
DATE: JANUARY 2022	

1" = 600'
1:7,200

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

FILE NO.: 418426-ExceedancesNE_ACM_20211229.mxd

Plot Date: 1/27/2022 09:57:54 AM by AFOJTIK - LAYOUT: ANSIB(11"x17")
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 Coordinate System: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl (Foot)
 Map Rotation: 0
 TRC - GCS



LEGEND

- DEK BOTTOM ASH POND MONITORING WELL
- DECOMMISSIONED MONITORING WELL
- NATURE AND EXTENT WELL
- GSI TRANSECT LOCATION/POREWATER SAMPLE
- NO EXCEEDANCES
- EXCEEDS CHRONIC MIXING ZONE GSI CRITERION (NOTES 3 + 4)
- EXCEEDS ACUTE MIXING ZONE GSI CRITERION (FAV) (NOTES 3 + 4)
- SLURRY WALL (APPROXIMATE)
- LINED IMPOUNDMENT (COVENANT BOUNDARY)
- POREWATER SAMPLING AREA

* GWPS EXCEEDANCE TRIGGERED ASSESSMENT OF CORRECTIVE MEASURES PURSUANT TO §257.96

WELL ID	CONSTITUENT(S)	EXCEEDING GSI
MW-06	Arsenic	*
DEK-MW-15004	Arsenic	*
DEK-MW-15003	Arsenic	*
MW-10	Arsenic	
MW-12	Arsenic	
MW-14	Arsenic	

- ### NOTES
- BASE MAP IMAGERY FROM GOOGLE EARTH PRO, 2018.
 - MONITORING WELL AND SLURRY WALL LOCATIONS PROVIDED BY CEC; SG21733SHT2 REV.B.DWG DATED 11/21/2018.
 - MIXING ZONE GSI CRITERIA FROM MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY (MDEQ) APPROVAL LETTER DATED DECEMBER 23, 2015.
 - GROUNDWATER CONCENTRATION DATA FROM MARCH THROUGH OCTOBER 2021 ARE SCREENED AGAINST THE MIXING ZONE CRITERIA. AN EXCEEDANCE IS DEFINED AS TWO CONSECUTIVE DETECTIONS ABOVE CRITERIA. COMPLIANCE WITH THE CHRONIC MIXING ZONE CRITERIA CAN BE DEMONSTRATED ON A MASS FLUX BASIS.



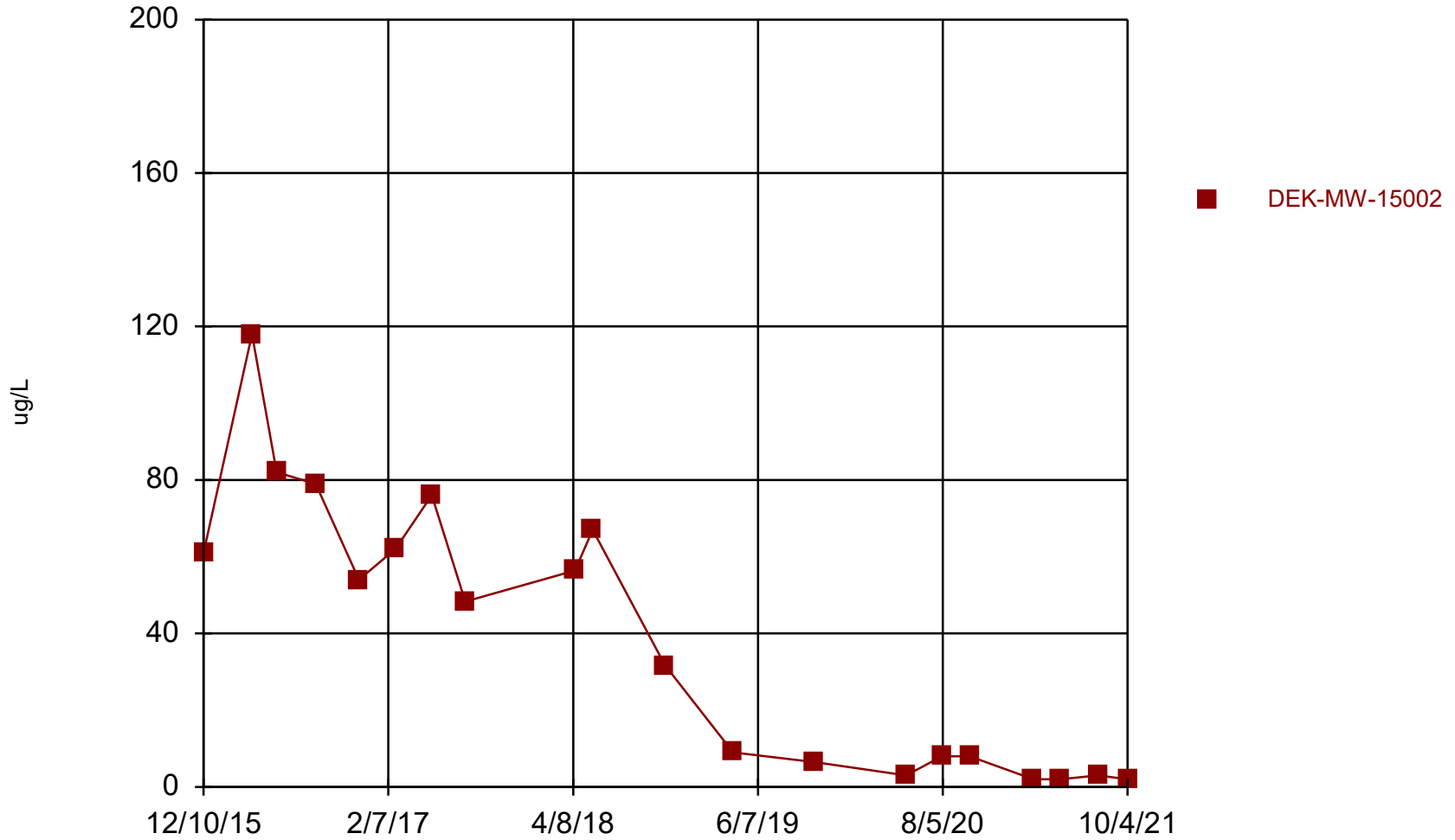
PROJECT:		CONSUMERS ENERGY COMPANY DE KARN POWER PLANT ESSEXVILLE, MICHIGAN	
TITLE:		ARSENIC NATURE AND EXTENT SUMMARY GSI PATHWAY COMPLIANCE	
DRAWN BY:	A. FOJTIK	PROJ NO.:	418425.0002
CHECKED BY:	K. LOWERY	FIGURE 2	
APPROVED BY:	D. LITZ		
DATE:	JANUARY 2022		

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

FILE NO.: 418425-ExceedancesNE_GSI_20211229.mxd

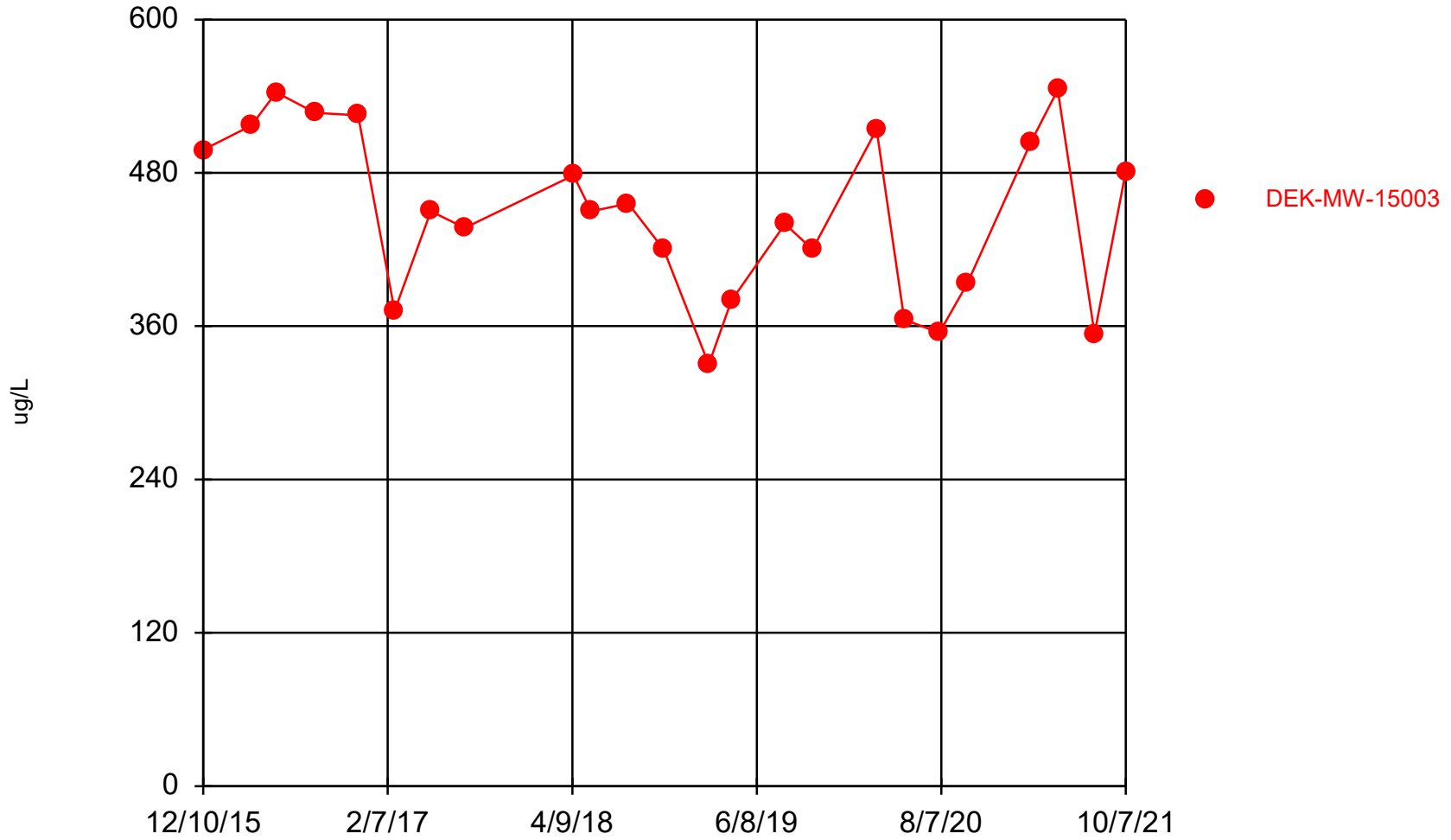
Attachment A Trend Evaluation

Arsenic, Total



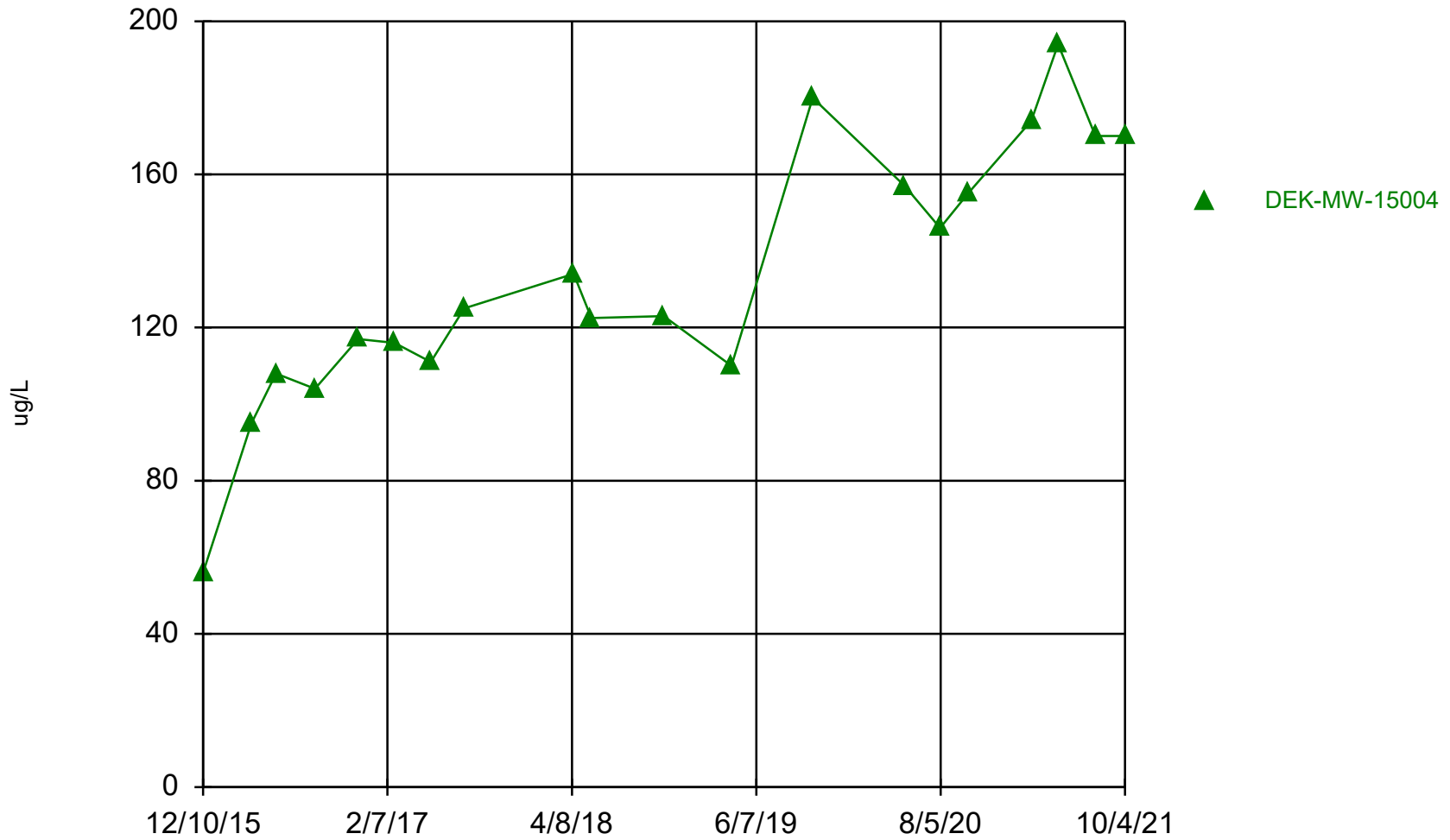
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Arsenic, Total



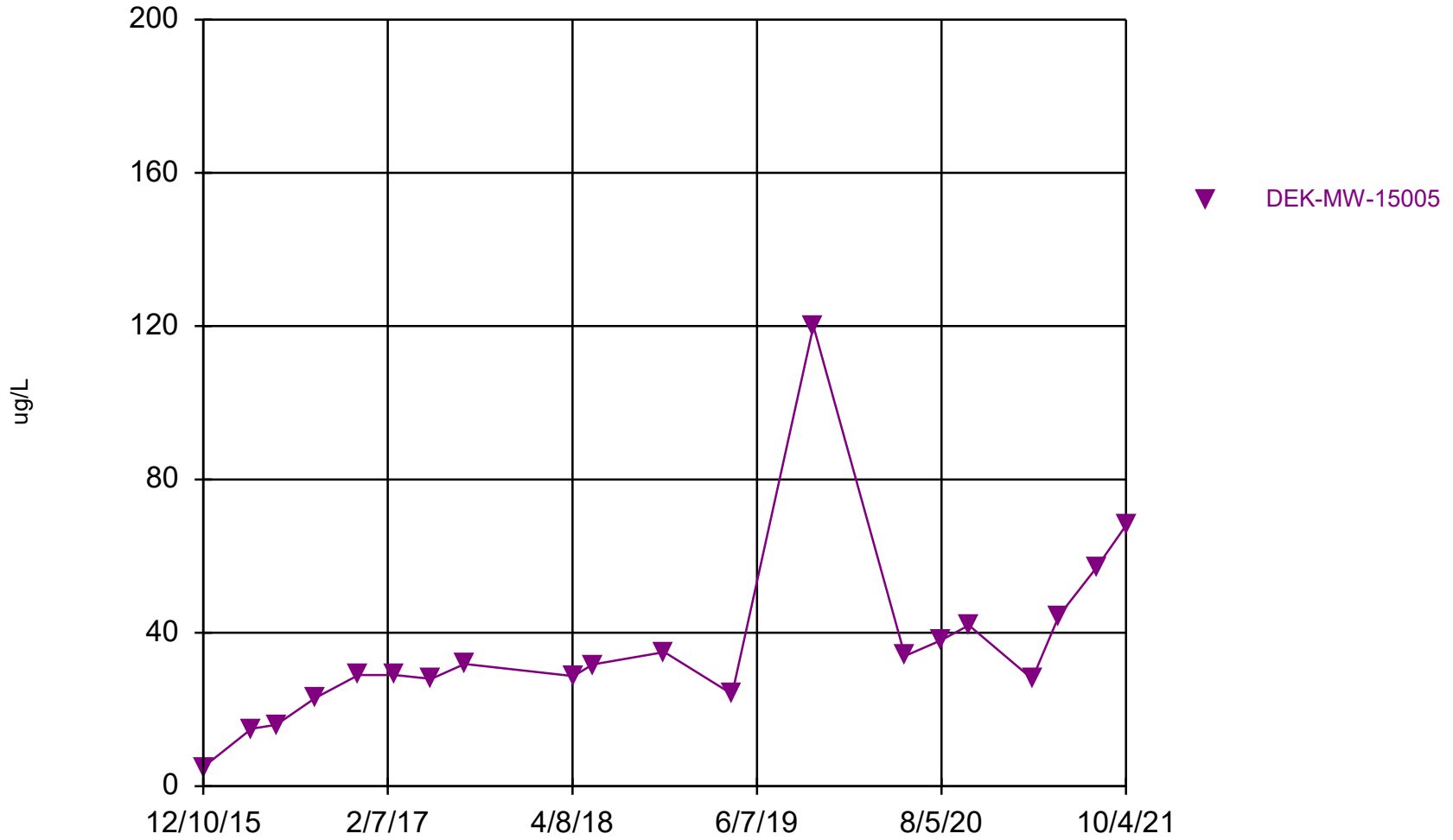
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Client: Consumers Energy Data: DEK_HMPCCR_Sanitas_21Q4

Arsenic, Total

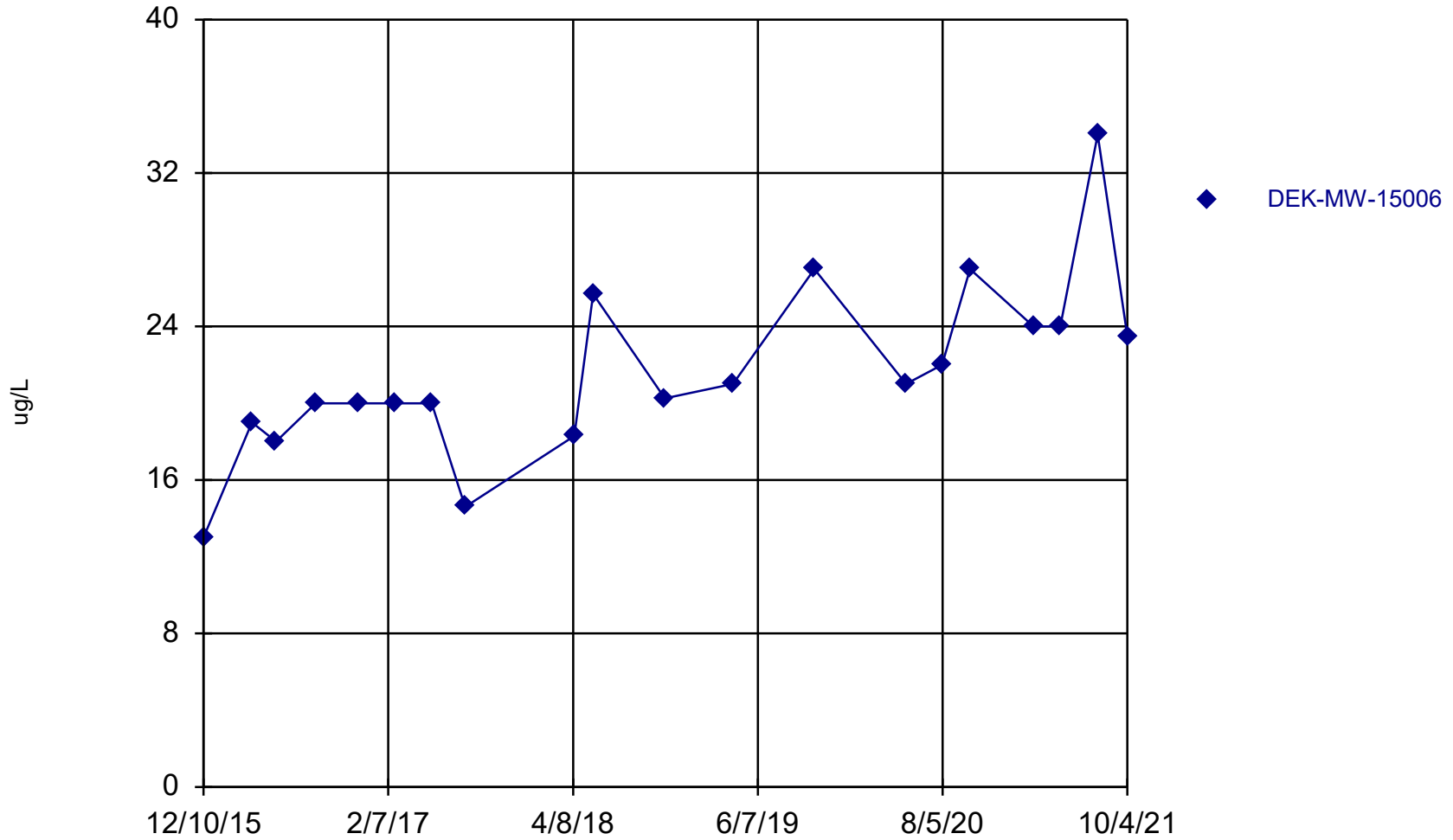


Time Series Analysis Run 1/3/2022 4:01 PM
Client: Consumers Energy Data: DEK_HMPCCR_Sanitas_21Q4

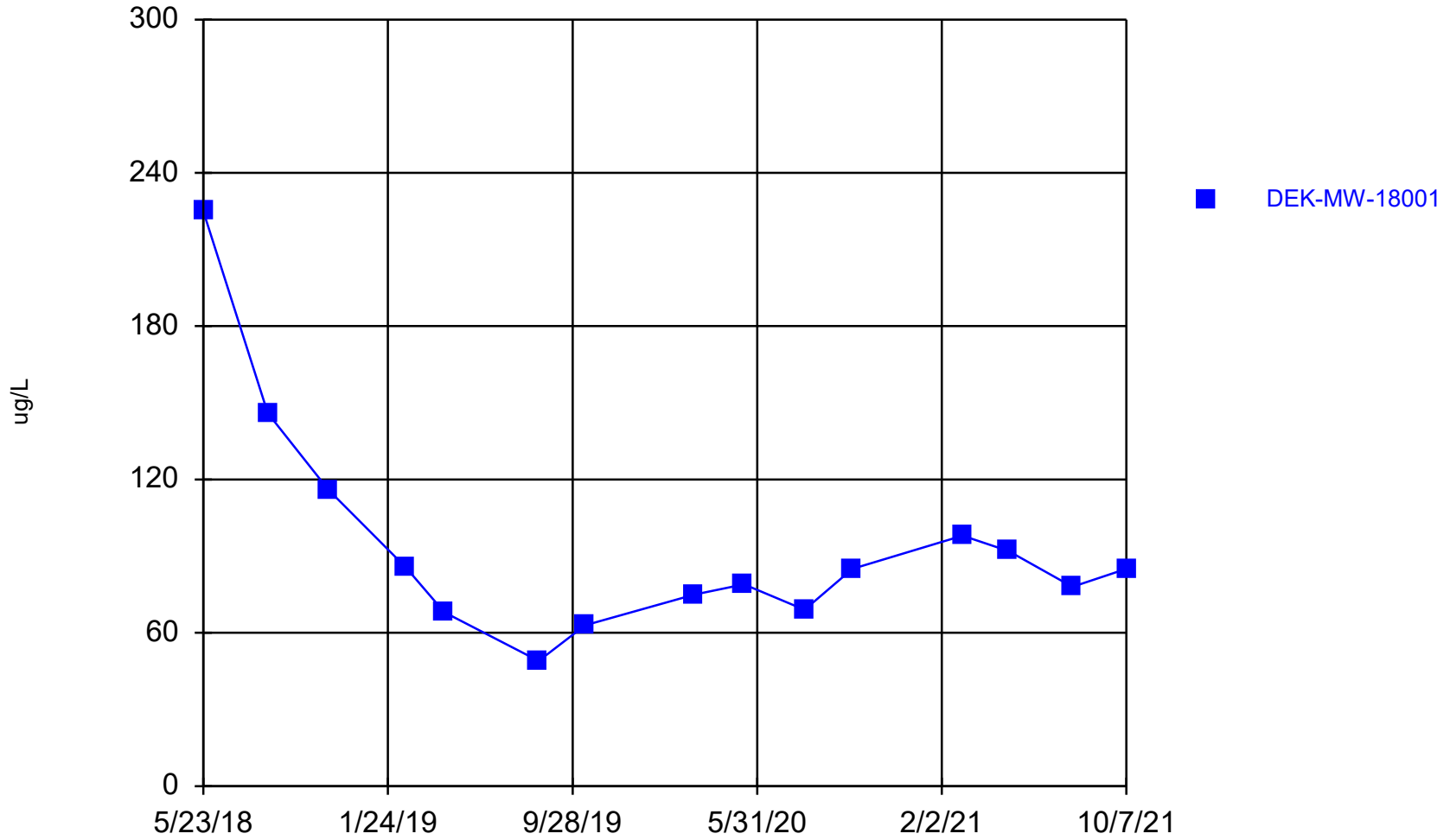
Arsenic, Total



Arsenic, Total

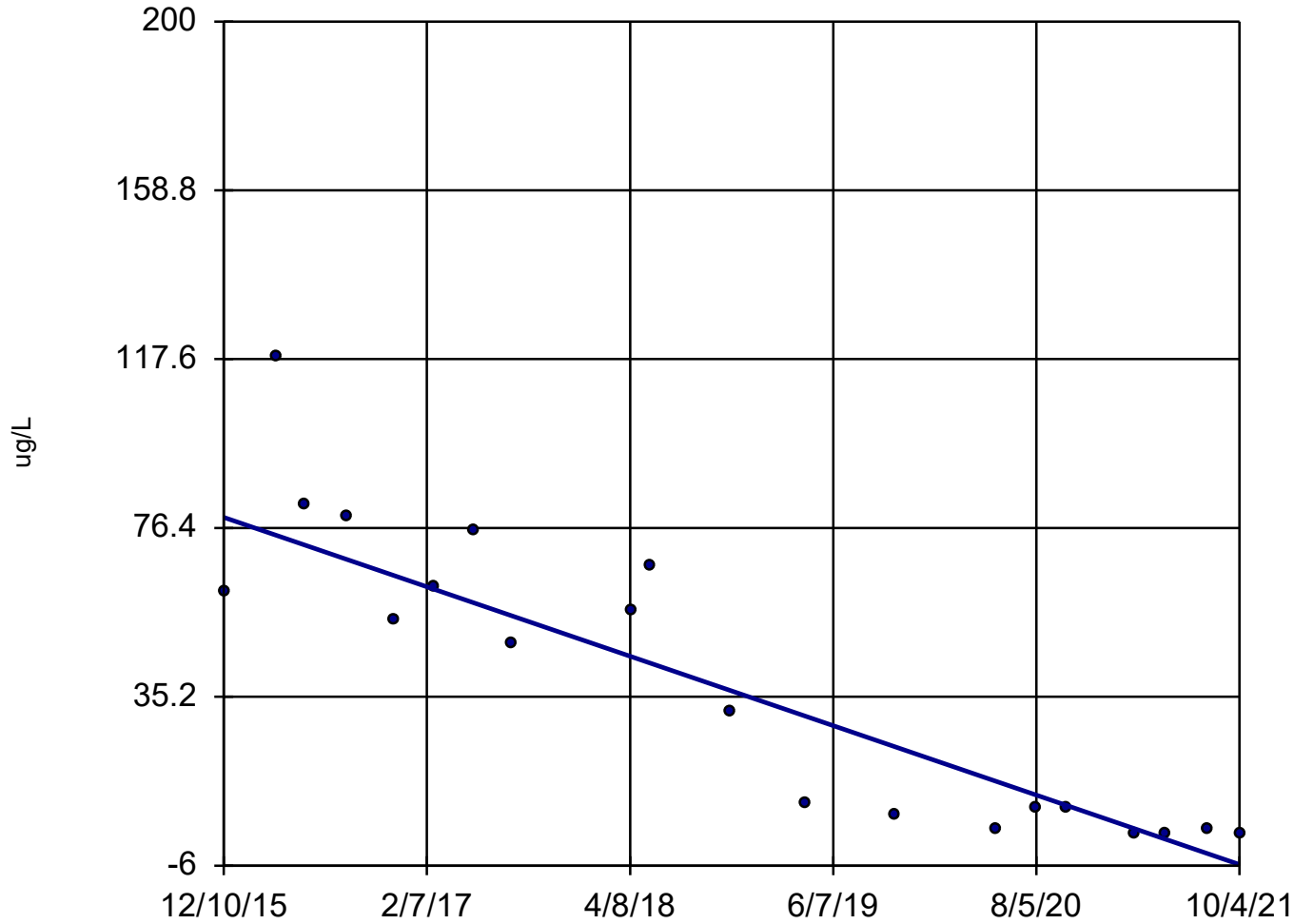


Arsenic, Total



Time Series Analysis Run 1/3/2022 4:01 PM
Client: Consumers Energy Data: DEK_HMPCCR_Sanitas_21Q4

Arsenic, Total DEK-MW-15002



n = 20

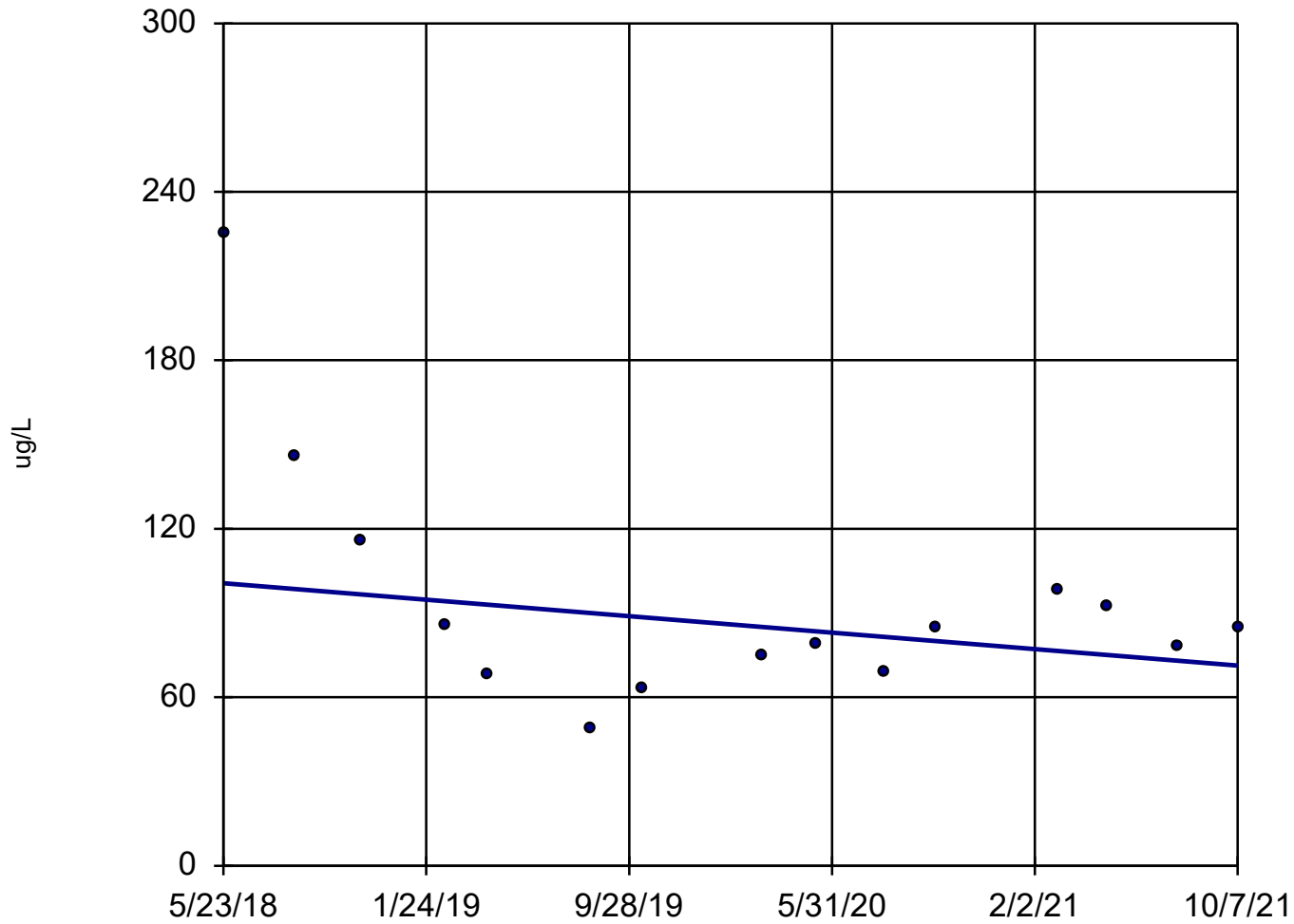
Slope = -14.55
units per year.

Mann-Kendall
statistic = -143
critical = -73

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

Sen's Slope Estimator Analysis Run 1/3/2022 4:03 PM
Client: Consumers Energy Data: DEK_HMPCCR_Sanitas_21Q4

Arsenic, Total DEK-MW-18001



n = 15
Slope = -8.69
units per year.
Mann-Kendall
statistic = -14
critical = -48
Trend not sig-
nificant at 98%
confidence level
($\alpha = 0.01$ per
tail).

Sen's Slope Estimator Analysis Run 1/3/2022 4:03 PM
Client: Consumers Energy Data: DEK_HMPCCR_Sanitas_21Q4