

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

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Environmental Services



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, <u>D.E. Karn</u> <u>Generating Facility Bottom Ash Pond CCR Removal Documentation Report</u> (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 <u>Assessment of Corrective</u> <u>Measures, DE Karn Bottom Ash Pond Coal Combustion Residual Unit</u>, 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 <u>known</u> 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 <u>May 2021 Assessment Monitoring Data Summary and Statistical Evaluation Consumers Energy, DE Karn Site, Bottom Ash Pond CCR Unit</u> (Enclosure 2) and <u>October 2021 Assessment Monitoring Data Summary and Statistical Evaluation Consumers Energy, DE Karn Site, Bottom Ash Pond CCR Unit</u> (Enclosure 2) and <u>October 2021 Assessment Monitoring Data Summary and Statistical Evaluation Consumers Energy, DE Karn Site, Bottom Ash Pond CCR Unit</u> (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 <u>Second Semiannual 2021 Nature and Extent Data Summary, DE Karn, Consumers Energy, Essexville, Michigan</u> (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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- CC: Mr. Phil Roycraft, EGLE Saginaw Bay District Office Mr. Mike Quigg, EGLE Saginaw Bay District Office Ms. Margie Ring, EGLE Lansing Office Mr. Jim Arduin, EGLE Lansing Office Mr. Caleb Batts, Consumers Energy Ms. Darby Litz, TRC Ms. Kristin Lowery, TRC Mr. Jacob Krenz, TRC
- Enclosures: 1) CCR Annual Groundwater Report Requirements: § 257.90(e). Checklist for the Karn Bottom Ash Pond CCR Unit.

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

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

4) <u>Second Semiannual 2021 Nature and Extent Data Summary, DE Karn, Consumers</u> <u>Energy, Essexville, Michigan</u>. (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 <sup>(3)</sup>
(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 decomissioning
(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 <sup>(2),(3)</sup>
(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 <sup>(1)</sup> ; Section 1.1 Program Summary <sup>(2),(3)</sup>
(5) Other information required to be included in the annual report as specified in §§ 257.90 through 257.98.	Nature and Extent Data Summary <sup>(4)</sup> ; Monitoring Well Network Recertification <sup>(3)</sup>
(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 <sup>(1)</sup> ; Section 1.1 Program Summary <sup>(2),(3)</sup>
(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 <sup>(1)</sup> ; Section 1.1 Program Summary <sup>(2),(3)</sup>
(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 <sup>(2),(3)</sup>
(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 <sup>(2),(3)</sup>
(B) Provide the date when the assessment monitoring program was initiated for the CCR unit.	Section 1.1 Program Summary <sup>(2),(3)</sup>
(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 <sup>(1)</sup> ; Section 1.1 Program Summary <sup>(2),(3)</sup>
(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 <sup>(2),(3)</sup>
(B) Provide the date when the assessment of corrective measures was initiated for the CCR unit;	Section 1.1 Program Summary <sup>(3)</sup>
(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 <sup>(1)</sup> ; Section 1.1 Program Summary <sup>(2),(3)</sup>
(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 <sup>(1)</sup> ; 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 <sup>(1)</sup> ; final remedy still under evaluation

#### Notes:

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

<sup>(2)</sup> 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.

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

<sup>(4)</sup> 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

Darby Litz Hydrogeologist/Project Manager

**Prepared For:** Consumers Energy Company

**Prepared By:** 

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### TABLE OF CONTENTS

1.0	Introduction						
	1.1	Program Summary	1				
	1.2	Site Overview	3				
	1.3	Geology/Hydrogeology	4				
2.0	Gro	undwater 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	Ass	essment Monitoring Statistical Evaluation	8				
	3.1	Establishing Groundwater Protection Standards	8				
	3.2	Data Comparison to Groundwater Protection Standards	.8				
4.0	Con	clusions and Recommendations	10				
5.0	Refe	erences	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				
pН	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 <sup>1</sup> )						
Detection Monitoring Assessment Monitoring						
Iron	Copper					

<sup>&</sup>lt;sup>1</sup> 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 6401)						
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 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 guarters 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

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<sup>™</sup> 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

	тос		Screen Interval	May 3, 2021		
Well Location	Elevation (ft)	Geologic Unit of Screen Interval	Elevation (ft)	Depth to Water (ft BTOC)	Groundwater Elevation (ft)	
Background	ļ			(1.2.00)	()	
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 Por	d		• •			
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 Pon	d & Karn Lined Im					
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 Exte	nt		L			
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 Lev	rel		· · ·			
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 2Summary of Field Parameters: May 2021DE Karn Bottom Ash Pond – RCRA CCR Monitoring Program<br/>Essexville, Michigan

Sample Location	Sample Date	Dissolved Oxygen	Oxidation Reduction Potential	рН	Specific Conductivity	Temperature	Turbidity
		(mg/L)	(mV)	(SU)	(umhos/cm)	(°C)	(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 Po	ond						
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: Sample Date:	<b>MW-15002</b> 5/3/2021	MW-15008 5/3/2021	<b>MW-15016</b> 5/3/2021
				MI Non-	Gampie Date.	0/0/2021		
Constituent	Unit	EPA MCL	MI Residential*	Residential*	MI GSI^		Backg	ground
Appendix III <sup>(1)</sup>								
Boron	ug/L	NC	500	500	4,000	102	121	349
Calcium	mg/L	NC	NC	NC	500 <sup>EE</sup>	364	105	219
Chloride	mg/L	250**	250 <sup>E</sup>	250 <sup>⊑</sup>	50	2,630	225	108
Fluoride	ug/L	4,000	NC	NC	NC	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	250**	250 <sup>E</sup>	250 <sup>⊑</sup>	500 <sup>EE</sup>	31.3	< 1	255
Total Dissolved Solids	mg/L	500**	500 <sup>E</sup>	500 <sup>E</sup>	500	5,390	822	979
pH, Field	SU	6.5 - 8.5**	6.5 - 8.5 <sup>E</sup>	6.5 - 8.5 <sup>⊑</sup>	6.5 - 9.0	6.5	6.8	7.2
Appendix IV <sup>(1)</sup>								
Antimony	ug/L	6	6	6	2	< 1	< 1	< 1
Arsenic	ug/L	10	10	10	10	1	< 1	4
Barium	ug/L	2,000	2,000	2,000	1,200	1,040	62	53
Beryllium	ug/L	4	4	4	33	< 1	< 1	< 1
Cadmium	ug/L	5	5	5	2.5	< 0.2	< 0.2	< 0.2
Chromium	ug/L	100	100	100	11	< 1	< 1	< 1
Cobalt	ug/L	NC	40	100	100	< 6	< 6	< 6
Fluoride	ug/L	4,000	NC	NC	NC	< 1,000	< 1,000	< 1,000
Lead	ug/L	NC	4	4	14	< 1	< 1	< 1
Lithium	ug/L	NC	170	350	440	19	15	79
Mercury	ug/L	2	2	2	0.20#	< 0.2	< 0.2	< 0.2
Molybdenum	ug/L	NC	73	210	120	< 5	< 5	< 5
Radium-226/228	pCi/L	5	NC	NC	NC	3.72	0.804	0.658
Selenium	ug/L	50	50	50	5	< 1	< 1	< 1
Thallium	ug/L	2	2	2	2	< 2	< 2	< 2
Additional MI Part 115 <sup>(2)</sup>								
Iron	ug/L	300**	300 <sup>E</sup>	300 <sup>E</sup>	500,000 <sup>EE</sup>	14,600	11,300	1,170
Copper	ug/L	1,000**	1,000 <sup>⊑</sup>	1,000E	20	1	1	1
Nickel	ug/L	NC	100	100	120	7	< 2	6
Silver	ug/L	100**	34	98	0.2	< 0.2	< 0.2	< 0.2
Vanadium	ug/L	NC	4.5	62	27	12	8	2
Zinc	ug/L	5,000**	2,400	5,000E	260	< 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.
- $^{\mathsf{E}}$  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.

MW_15010	
MW-15019	
5/3/2021	
239	
155 344 < 1,000 52.4	
344	
< 1,000	
52.4	
1,160	
6.8	
< 1	
1	
335	
< 1	
$ \begin{array}{r} 335 \\ < 1 \\ < 0.2 \\ < 1 \\ < 6 \\ < 1,000 \\ < 1 \\ 12 \\ < 0.2 \\ \end{array} $	
< 1	
< 6	
< 1,000	
< 1	
12	
< 0.2	
< 5	
0.902	
4	
< 2	
14,300	
< 1 28	
28	
< 0.2	
4	
< 10	

# Table 4 Summary of Groundwater Sampling Results (Analytical): May 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:	5/3/2021	5/3/2021	5/3/2021	5/3/2021	5/3/2021	5/3/2021
				MI Non-		downgradient	upgradient	sidegradient	downgradient	downgradient	downgradient
Constituent	Unit	EPA MCL	MI Residential*	Residential*	MI GSI^	uowngraulent	upgradient	Sidegradierit	uowngraulent	downgradient	downgradient
Appendix III <sup>(1)</sup>											
Boron	ug/L	NC	500	500	4,000	1,420	862	914	926	938	1,180
Calcium	mg/L	NC	NC	NC	500 <sup>EE</sup>	148	27.4	60.2	95.6	115	65.2
Chloride	mg/L	250**	250 <sup>E</sup>	250 <sup>E</sup>	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 <sup>E</sup>	250 <sup>E</sup>	500 <sup>EE</sup>	216	32.5	143	50.8	324	121
Total Dissolved Solids	mg/L	500**	500 <sup>E</sup>	500 <sup>E</sup>	500	926	246	493	534	790	486
pH, Field	SU	6.5 - 8.5**	6.5 - 8.5 <sup>⊑</sup>	6.5 - 8.5 <sup>⊑</sup>	6.5 - 9.0	7.4	8.0	7.5	7.6	7.5	7.3
Appendix IV <sup>(1)</sup>											
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 <sup>(2)</sup>											
Iron	ug/L	300**	300 <sup>E</sup>	300 <sup>E</sup>	500,000EE	2,800	141	1,980	421	1,560	761
Copper	ug/L	1,000**	1,000E	1,000 <sup>E</sup>	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	5,000E	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.

 $^{\rm E}$  - Criterion is the aesthetic drinking water value per footnote {E}.

 $^{\mbox{\scriptsize EE}}$  - Criterion is based on the total dissolved solids GSI value per footnote {EE}.

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

(2) Per Michigan Part 115 Amendments - Public Act No. 640 of 2018 Section 11511a(3)(c) and 11519b(2) additional detection

monitoring constituents (iron) and assessment monitoring constituents (copper, nickel, silver, vanadium, and zinc) are reported.

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

RED value indicates an exceedance of the MCL.

All metals were analyzed as total unless otherwise specified.

# Table 5 Summary of Groundwater Protection Standard Exceedances – May 2021 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**



S\1-PROJECTS\Consumers\_Energy\_Company\Michigan\CCR\_GW\2017\_269767\367388-001-004.mxd -- Saved By: SMAJOR on 7/15/2020, 14:00:57 PM



### **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

- ✦ SURFACE WATER SAMPLE (SW-DITCH)
- SLURRY WALL (APPROXIMATE)



LINED IMPOUNDMENT (COVENANT BOUNDARY)

### <u>NOTES</u>

- 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).
- 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.



1 " = 600

MW-16

. . . .

MW-50

1:7,200

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

1,200

TITLE:

### SITE LAYOUT MAP

DRAWN BY:	A. ADAIR	PROJ NO.:	418425.0001
CHECKED BY:	J. KRENZ		
APPROVED BY:	L. DARBY	FIGURE 2	
DATE:	APRIL 2021		

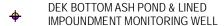


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418425-101-002.mxd



### **LEGEND**



- ✦ DEK BOTTOM ASH POND MONITORING WELL
- ✤ DEK LINED IMPOUNDMENT MONITORING WELL
- DECOMMISSIONED MONITORING WELL
- ✤ MONITORING WELL (STATIC ONLY)
- SURFACE WATER GAUGING STATION
- SLURRY WALL (APPROXIMATE)

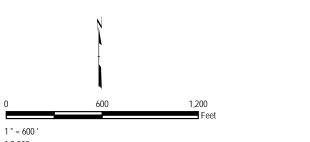


LINED IMPOUNDMENT (COVENANT BOUNDARY)

- GROUNDWATER ELEVATION CONTOUR
  (1' INTERVAL, DASHED WHERE INFERRED)
- (580.50) GROUNDWATER ELEVATION (FEET)

### <u>NOTES</u>

- 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.



1:7,200 PROJECT:

### CONSUMERS ENERGY COMPANY DE KARN POWER PLANT ESSEXVILLE, MICHIGAN

### SHALLOW GROUNDWATER CONTOUR MAP MAY 3, 2021

DRAWN BY:	A. ADAIR	PROJ NO.:	418425.0001
CHECKED BY:	J. KRENZ		
APPROVED BY:	L. DARBY	FIGUR	F 3
DATE:	JULY 2021	1 CON	20



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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
То:	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 <sup>1</sup> 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	<b>#Downgradient Wells Observed</b>
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

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<sup>&</sup>lt;sup>1</sup> 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).

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 Guidance <sup>2</sup>, 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

<sup>&</sup>lt;sup>2</sup> 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<sup>TM</sup> statistical software. Sanitas<sup>TM</sup> is a software tool that is commercially available for performing statistical evaluation consistent with procedures outlined in the Unified Guidance. Within the Sanitas<sup>TM</sup> 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 test<sup>3</sup> 99 percent confidence level, i.e., a significance level ( $\alpha$ ) of 0.01. The following narrative describes the methods employed, the results obtained and the Sanitas<sup>TM</sup> 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<sup>™</sup> 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

<sup>&</sup>lt;sup>3</sup> 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<sup>TM</sup> 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<sup>™</sup> 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<sup>™</sup> Output Files

# Table

Sample Location:									C	EK-MW-1500	2			
	-				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													Field Dup	
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.

				S	ample Location:						D	EK-MW-150	05					
	-		•		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							downgradien	t					
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.

 $\mathsf{GWPS}$  - Groundwater Protection Standard.  $\mathsf{GWPS}$  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.

Sample Location:									D	EK-MW-1500	6			
	-				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 <sup>(1)</sup>	< 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.

				S	ample Location:			[	DEK-MW-1800	1		
					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.

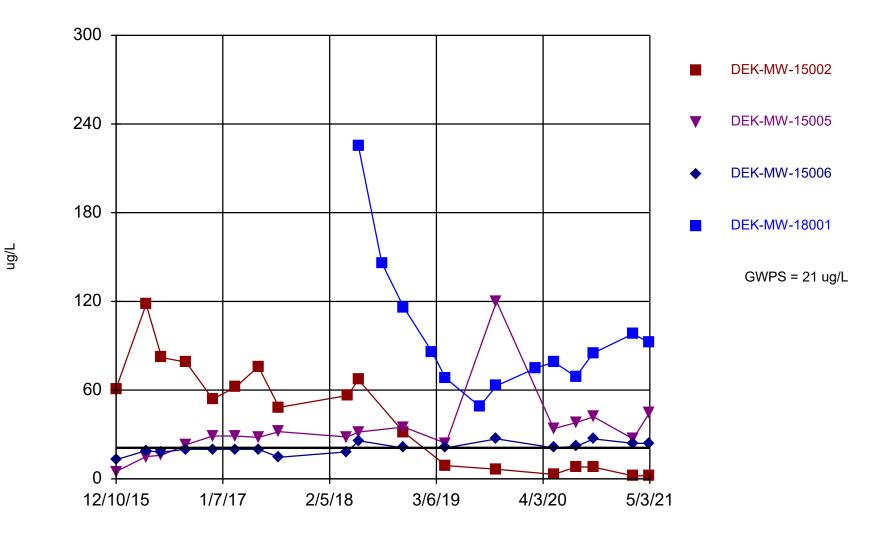
Bold value indicates an exceedance of the GWPS. Data from downgradient monitoring wells are screened against the

GWPS for evaluation purposes only. Confidence intervals will be used to determine compliance per the CCR rules.

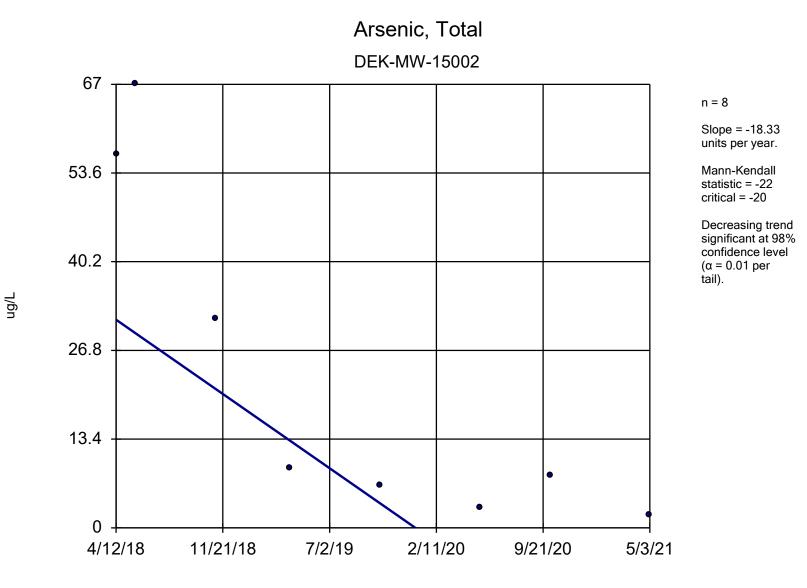
All metals were analyzed as total unless otherwise specified.

# Attachment 1 Sanitas™ Output Files

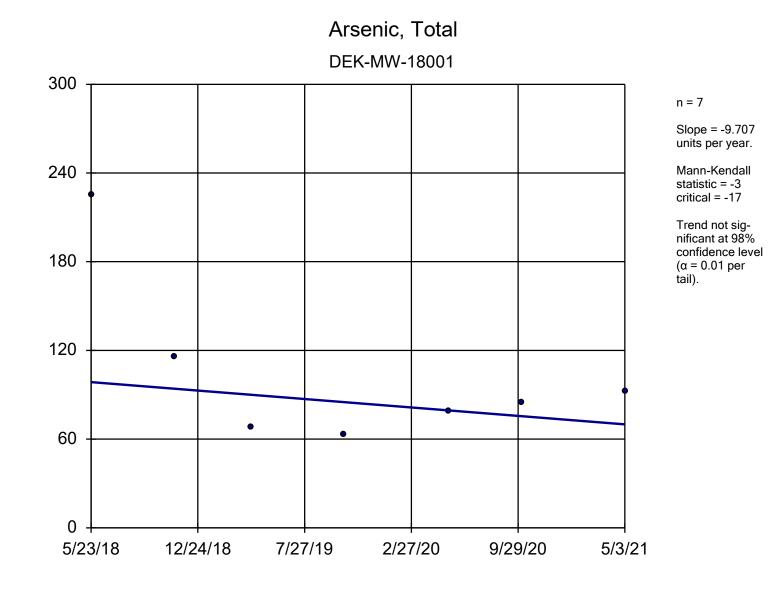
Arsenic, Total

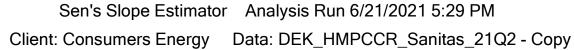


Time Series Analysis Run 6/30/2021 8:38 AM Client: Consumers Energy Data: DEK\_HMPCCR\_Sanitas\_21Q2.rev1



Sen's Slope Estimator Analysis Run 6/21/2021 5:27 PM Client: Consumers Energy Data: DEK\_HMPCCR\_Sanitas\_21Q2 - Copy





ng/L

#### **Summary Report**

Constituent: Arsenic, Total Analysis Run 6/21/2021 5:30 PM Client: Consumers Energy Data: DEK\_HMPCCR\_Sanitas\_21Q2 - Copy

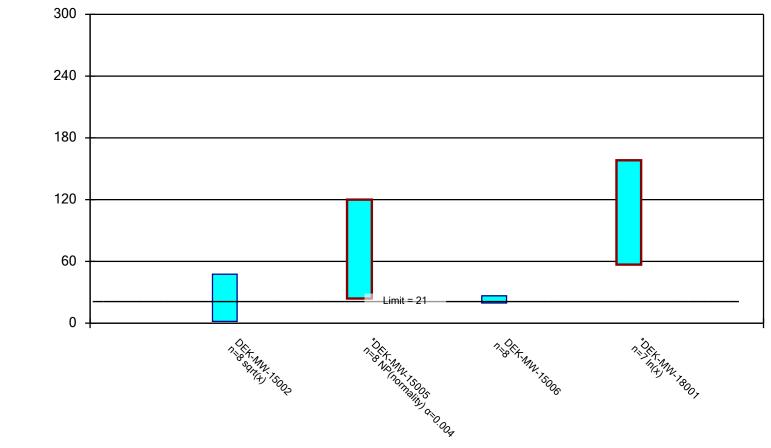
For observations made between 4/11/2018 and 5/3/2021, a summary of the selected data set:

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

Well	#Obs.	ND/Trace	Min	Max	Mean	Median	Std.Dev.	CV	Skewness
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

ng/L

### **Confidence Interval**

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

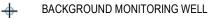
Client: Consumers Energy Data: DEK\_HMPCCR\_Sanitas\_21Q2 - Copy

	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





BEDROCK MONITORING WELL

- ÷ DEK BOTTOM ASH POND MONITORING WELL
- JCW BOTTOM ASH POND MONITORING WELL
- JCW LANDFILL MONITORING WELL -🔶
- SURFACE WATER GAUGING STATION Ξ
- SLURRY WALL (APPROXIMATE)



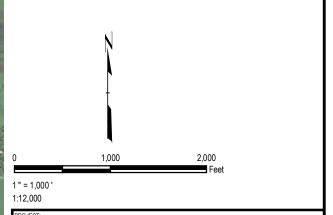
GROUNDWATER ELEVATION CONTOUR (2' INTERVAL, DASHED WHERE INFERRED)

(580.85)

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. 2
- NOAA/NATIONAL OCEANIC SERVICE GREAT LAKES 3. GAUGING STATION, ESSEXVILLE, MI (ID: 9075035).



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

SHALLOW GROUNDWATER CONTOUR MAP **DECEMBER 2015** 

DRAWN BY:	J. PAPEZ	PROJ NO.:	269767-002/3
CHECKED BY:	D. LITZ		
APPROVED BY:	G. CROCKFORD		FIGURE 1
DATE:	OCTOBER 2017		
	RC		1540 Eisenhower Place Ann Arbor, MI 48108-3284 Phone: 734.971.7080 www.trcsolutions.com

Phone: 734.971.7080 www.trcsolutions.com

269767-002\_3-001.mxd



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BEDROCK MONITORING WELL

DEK BOTTOM ASH POND MONITORING WELL

JCW BOTTOM ASH POND MONITORING WELL

JCW LANDFILL MONITORING WELL -🔶

Ξ SURFACE WATER GAUGING STATION

SLURRY WALL (APPROXIMATE)



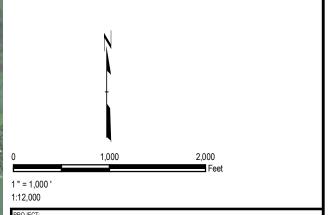
GROUNDWATER ELEVATION CONTOUR (2' INTERVAL, DASHED WHERE INFERRED)

(580.85)

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. 2
- NOAA/NATIONAL OCEANIC SERVICE GREAT LAKES 3. GAUGING STATION, ESSEXVILLE, MI (ID: 9075035).



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

SHALLOW GROUNDWATER CONTOUR MAP **MARCH 2016** 

DRAWN BY:	J. PAPEZ	PROJ NO.: 269767-002	/3
CHECKED BY:	D. LITZ		
APPROVED BY:	G. CROCKFORD	FIGURE 2	
DATE:	OCTOBER 2017		
	RC	1540 Eisenhower Place Ann Arbor, MI 48108-3284 Phone: 734.971.7080 www.trcsolutions.com	

Phone: 734.971.7080 www.trcsolutions.com

269767-002\_3-002.mxd





BEDROCK MONITORING WELL

÷ DEK BOTTOM ASH POND MONITORING WELL

JCW BOTTOM ASH POND MONITORING WELL

-🔶 JCW LANDFILL MONITORING WELL

Ξ SURFACE WATER GAUGING STATION

SLURRY WALL (APPROXIMATE)

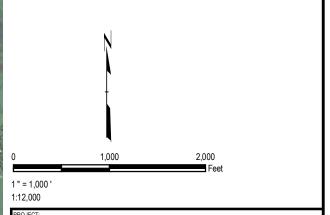
GROUNDWATER ELEVATION CONTOUR (2' INTERVAL, DASHED WHERE INFERRED)

(580.85)

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. 2
- NOAA/NATIONAL OCEANIC SERVICE GREAT LAKES 3. GAUGING STATION, ESSEXVILLE, MI (ID: 9075035).



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

SHALLOW GROUNDWATER CONTOUR MAP MAY 2016

DRAWN BY:	J. PAPEZ	PROJ NO.: 269767-002
CHECKED BY:	D. LITZ	
APPROVED BY:	G. CROCKFORD	FIGURE 3
DATE:	OCTOBER 2017	
	RC	1540 Eisenhower Place Ann Arbor, MI 48108-3284 Phone: 734.971.7080 www.trcsolutions.com

Phone: 734.971.7080 www.trcsolutions.com

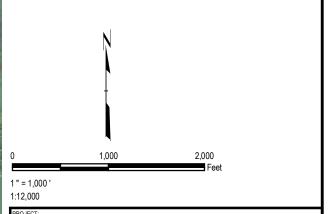
269767-002\_3-003.mxd



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

# 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).



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

SHALLOW GROUNDWATER CONTOUR MAP AUGUST 2016

DRAWN BY:	J. PAPEZ	PROJ NO.:	269767-002/3
CHECKED BY:	D. LITZ		
APPROVED BY:	G. CROCKFORD		FIGURE 4
DATE:	OCTOBER 2017		
	RC		1540 Eisenhower Place Ann Arbor, MI 48108-3284 Phone: 734.971.7080 www.trcsolutions.com

www.trcsolutions.com 269767-002\_3-004.mxd



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BEDROCK MONITORING WELL

DEK BOTTOM ASH POND MONITORING WELL

JCW BOTTOM ASH POND MONITORING WELL

JCW LANDFILL MONITORING WELL -🔶

Ξ SURFACE WATER GAUGING STATION

SLURRY WALL (APPROXIMATE)



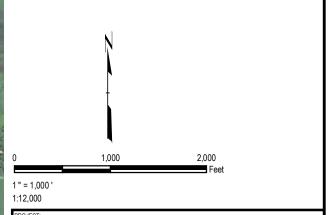
GROUNDWATER ELEVATION CONTOUR (2' INTERVAL, DASHED WHERE INFERRED)

(580.85)

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. 2
- NOAA/NATIONAL OCEANIC SERVICE GREAT LAKES 3. GAUGING STATION, ESSEXVILLE, MI (ID: 9075035).



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

SHALLOW GROUNDWATER CONTOUR MAP **NOVEMBER 2016** 

DRAWN BY:	J. PAPEZ	PROJ NO.:	269767-002/3
CHECKED BY:	D. LITZ		
APPROVED BY:	G. CROCKFORD		FIGURE 5
DATE:	OCTOBER 2017		
	RC		1540 Eisenhower Place Ann Arbor, MI 48108-3284 Phone: 734.971.7080 www.trcsolutions.com

Phone: 734.971.7080 www.trcsolutions.com

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BEDROCK MONITORING WELL

DEK BOTTOM ASH POND MONITORING WELL

JCW BOTTOM ASH POND MONITORING WELL

■ SURFACE WATER GAUGING STATION

SLURRY WALL (APPROXIMATE)



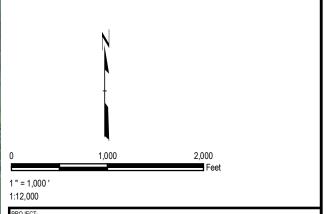
GROUNDWATER ELEVATION CONTOUR (2' INTERVAL, DASHED WHERE INFERRED)

(580.85)

GROUNDWATER ELEVATION (FEET, MSL)

#### <u>NOTES</u>

- 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).



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

SHALLOW GROUNDWATER CONTOUR MAP FEBRUARY 2017

DRAWN BY:	J. PAPEZ	PROJ NO.:	269767-002/3
CHECKED BY:	D. LITZ		
APPROVED BY:	G. CROCKFORD		FIGURE 6
DATE:	OCTOBER 2017		
	RC		1540 Eisenhower Place Ann Arbor, MI 48108-3284 Phone: 734.971.7080 www.trcsolutions.com

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- 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)
- ← G (2

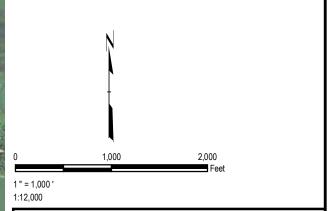
GROUNDWATER ELEVATION CONTOUR (2' INTERVAL, DASHED WHERE INFERRED)



GROUNDWATER ELEVATION (FEET, MSL)

#### <u>NOTES</u>

- 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).



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

SHALLOW GROUNDWATER CONTOUR MAP MAY 2017

DRAWN BY:	J. PAPEZ	PROJ NO.:	269767-002/3
CHECKED BY:	D. LITZ		
APPROVED BY:	G. CROCKFORD		FIGURE 7
DATE:	OCTOBER 2017		
	RC		1540 Eisenhower Place Ann Arbor, MI 48108-3284 Phone: 734.971.7080 www.trcsolutions.com

www.trcsolutions.com 269767-002\_3-009.mxd



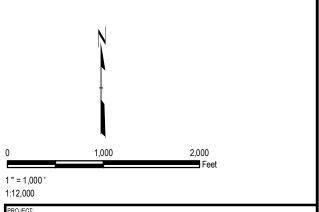
- BEDROCK MONITORING WELL
- DEK BOTTOM ASH POND MONITORING WELL
- ► JCW BOTTOM ASH POND MONITORING WELL
- -&- JCW LANDFILL MONITORING WELL
- SURFACE WATER GAUGING STATION
- SLURRY WALL (APPROXIMATE)

GROUNDWATER ELEVATION CONTOUR (2' INTERVAL, DASHED WHERE INFERRED) GROUNDWATER ELEVATION (FEET, MSL)

(580.85)

# <u>NOTES</u>

- 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).



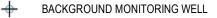
#### CONSUMERS ENERGY COMPANY DE KARN AND JC WEADOCK POWER PLANTS ESSEXVILLE, MICHIGAN

SHALLOW GROUNDWATER CONTOUR MAP AUGUST 2017

DRAWN BY:	J. PAPEZ	PROJ NO.:	269767-002/3
CHECKED BY:	D. LITZ		
APPROVED BY:	G. CROCKFORD		FIGURE 8
DATE:	OCTOBER 2017		
	RC		1540 Eisenhower Place Ann Arbor, MI 48108-3284 Phone: 734.971.7080 www.trcsolutions.com

www.trcsolutions.com 269767-002\_3-019.mxd





- DEK BOTTOM ASH POND MONITORING WELL
- JCW BOTTOM ASH POND MONITORING WELL
- SURFACE WATER GAUGING STATION
- MONITORING WELL (STATIC WATER LEVEL ONLY)
- SLURRY WALL (APPROXIMATE)

¢

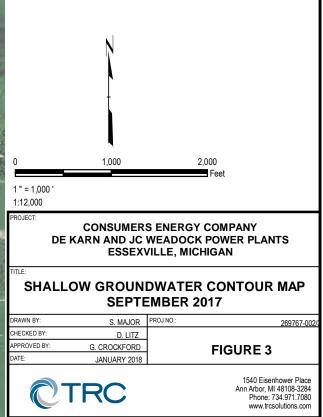
GROUNDWATER ELEVATION CONTOUR (2' INTERVAL, DASHED WHERE INFERRED)



GROUNDWATER ELEVATION (FEET, MSL)

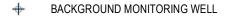
#### <u>NOTES</u>

- 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).



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- 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)

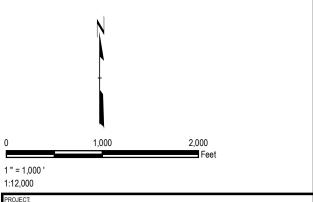
GROUNDWATER ELEVATION CONTOUR (2' INTERVAL, DASHED WHERE INFERRED)

(580.85)

GROUNDWATER ELEVATION (FEET, MSL)

#### <u>NOTES</u>

- 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.



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

SHALLOW GROUNDWATER CONTOUR MAP APRIL 2018

DRAWN BY:	S. MAJOR	PROJ NO.: 290805-
CHECKED BY:	C. SCIESZKA	
APPROVED BY:	D. LITZ	FIGURE 2
DATE:	OCTOBER 2018	
	RC	1540 Eisenhower Place Ann Arbor, MI 48108-3284 Phone: 734-971/7080

290805-001-001x.mxd

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- + 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 ø
- -¢-EXTRACTION WELL
- -**b**-JCW BEDROCK MONITORING WELL
- ÷ JCW BOTTOM ASH POND MONITORING WELL
- -�-JCW LANDFILL MONITORING WELL
- MONITORING WELL (STATIC WATER LEVEL ONLY)
- PIEZOMETER

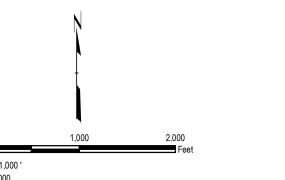
GROUNDWATER ELEVATION CONTOUR (2' INTERVAL, DASHED WHERE INFERRED)

SLURRY WALL (APPROXIMATE)

GROUNDWATER ELEVATION (FEET, MSL) (580.85)

#### NOTES

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



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

#### ROJECT

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

SHALLOW GROUNDWATER CONTOUR MAP MAY 2018

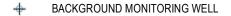
DRAWN BY:	S. MAJOR	PROJ NO.: 29080	5-001
CHECKED BY:	C. SCIESZKA		
APPROVED BY:	D. LITZ	FIGURE 3	
DATE:	OCTOBER 2018		
	<b>IRC</b>	1540 Eisenhower Pla Ann Arbor, MI 48108-32 Phone: 734.971.70 www.trcsolutions.co	84 80

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

290805-001-005 m



### **LEGEND**



- ✤ 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
- + MONITORING WELL (STATIC WATER LEVEL ONLY)
- -↔ LEACHATE HEADWELL
- SURFACE WATER GAUGING STATION
- SLURRY WALL (APPROXIMATE)



(KARN LINED IMPOUNDMENT)
 GROUNDWATER ELEVATION CONTOUR
 (2' INTERVAL, DASHED WHERE INFERRED)

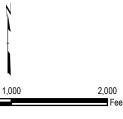
EXTENT OF GEOSYNTHETICS

(580.50) GROUNDWATER ELEVATION (FEET)

(NM) NOT MEASURED

### <u>NOTES</u>

- 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.



1 " = 1,000 '

#### 1:12,000 PROJECT:

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

### SHALLOW GROUNDWATER CONTOUR MAP NOVEMBER 2018

DRAWN BY:	S. MAJOR	PROJ NO.:	322173-001
CHECKED BY:	J. KRENZ		
APPROVED BY:	D. LITZ	FIGUE	RE 2
DATE:	MARCH 2019	11001	
		15	540 Fisenhower Place

**C**TRC

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

290805-001-022.mxd



### LEGEND

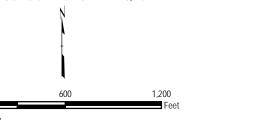


- DEK BOTTOM ASH POND MONITORING WELL
- ➡ DEK LINED IMPOUNDMENT MONITORING WELL
- ✤ DECOMMISSIONED MONITORING WELL
- ✤ MONITORING WELL (STATIC ONLY)
- SURFACE WATER GAUGING STATION
- +- NATURE AND EXTENT WELL
- SLURRY WALL (APPROXIMATE)
- EXTENT OF GEOSYNTHETICS (KARN LINED IMPOUNDMENT)
- GROUNDWATER ELEVATION CONTOUR (2' INTERVAL, DASHED WHERE INFERRED)
- (580.50) GROUNDWATER ELEVATION (FEET)

(NM) NOT MEASURED

### <u>NOTES</u>

- 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.





#### CONSUMERS ENERGY COMPANY DE KARN POWER PLANT ESSEXVILLE, MICHIGAN

### SHALLOW GROUNDWATER CONTOUR MAP APRIL 2019

J. KRENZ	
D. LITZ	FIGURE 3
ANUARY 2020	1 IOONE 0
	D. LITZ



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FILE NO.

POND B5

322172\_3-004-02.mxd



oordinate System: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl (Foo

Plot Date: 1/29/2020, 16:23:59 PM by MVAPHIADIS -- LAYOUT: ANSI B(11'x17' Path: F-1C:msumereEnerw/CCR\_GM 2017\_269751323717\_3-005-07 mvd

### 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
- 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.



1 " = 600

......

POND B5

1:7,200 PROJECT:

#### CONSUMERS ENERGY COMPANY DE KARN POWER PLANT ESSEXVILLE, MICHIGAN

1,200

### SHALLOW GROUNDWATER CONTOUR MAP OCTOBER 2019

S. MAJOR	PROJ NO.:	322172-001
J. KRENZ		
D. LITZ	FIGURE 4	
JANUARY 2020		
	J. KRENZ D. LITZ	J. KRENZ D. LITZ FIGURE 4



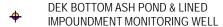
1540 Eisenhower Place Ann Arbor, MI 48108-3284 Phone: 734.971.7080 www.trccompanies.com

FILE NO.

322172\_3-005-02.mxd



### **LEGEND**

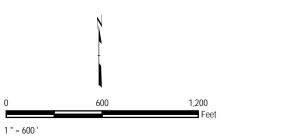


- DEK BOTTOM ASH POND MONITORING WELL
- ✦ DEK LINED IMPOUNDMENT MONITORING WELL
- DECOMMISSIONED MONITORING WELL
- ✤ MONITORING WELL (STATIC ONLY)
- SURFACE WATER GAUGING STATION
- +- NATURE AND EXTENT WELL
- SLURRY WALL (APPROXIMATE)
- EXTENT OF GEOSYNTHETICS (KARN LINED IMPOUNDMENT) GROUNDWATER ELEVATION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

(NM) NOT MEASURED

### <u>NOTES</u>

- 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.



1:7,200 PROJECT:

<u>MW-16</u>

#### CONSUMERS ENERGY COMPANY DE KARN POWER PLANT ESSEXVILLE, MICHIGAN

### SHALLOW GROUNDWATER CONTOUR MAP MAY 11, 2020

DRAWN BY:	S. MAJOR	PROJ NO.:	367388.0001
CHECKED BY:	J. KRENZ		
APPROVED BY:	D. LITZ	FIGUF	2F 3
DATE:	JULY 2020	11001	



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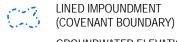
367388-001-006.mxd



### **LEGEND**



- 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)

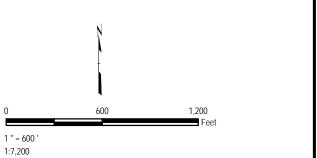


GROUNDWATER ELEVATION CONTOUR (1' INTERVAL, DASHED WHERE INFERRED)

(580.50) GROUNDWATER ELEVATION (FEET)

### <u>NOTES</u>

- 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

### SHALLOW GROUNDWATER CONTOUR MAP OCTOBER 5, 2020

S. MAJOR	PROJ NO.:	367388.0001
J. KRENZ		
D. LITZ	FIGURE	3
JANUARY 2021		
	J. KRENZ D. LITZ	J. KRENZ D. LITZ FIGURE 3



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

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

135 W. Trail St.

Jackson, MI 49201

#### Chemistry Project: 21-0525

*phone* 517-788-1251 *fax* 517-788-2533

TRC Environmental, Inc. conducted groundwater monitoring at the Karn/Weadock Background Wells area on 05/03/2021, for the 2<sup>nd</sup> 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 accredidation 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, 22<sup>nd</sup> Edition, 2012.

#### III. <u>Results/Quality Control</u>

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:

Acronym	Description
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>	Description
*	Generic data flag, applicable description added in the corresponding notes section
В	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
Н	The maximum recommended hold time was exceeded
Ι	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
Μ	The precision for duplicate analysis was not met; RPD outside acceptance criteria
Ν	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
Х	Other notation required; comment listed in sample notes and/or case narrative



# Customer Name:Karn/Weadock ComplexWork Order ID:Q2\_2020 DEK & JCW RCRA Background WellsDate Received:5/5/2021Chemistry Project:21-0525

Sample #	Field Sample ID	Matrix	Sample Date	<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



### Sample Site:DEK JCW BackgroundLaboratory Project:21-0525Field Sample ID:MW-15002Collect Date:05/03/2021Lab Sample ID:21-0525-01Collect Time:02:00 PMMatrix:GroundwaterGroundwaterGroundwaterGroundwater

Mercury by EPA 7470A, To	tal, 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: CCF	R Rule Appendix III-IV To	tal 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

Anions by EPA 300.0 CCR Rule Analy	nions 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 #

ug/L

mg/L

10

10

05/13/2021

05/07/2021

AB21-0514-08

AB21-0507-02

ND

5390

Total Dissolved Solids

Zinc



### Sample Site:DEK JCW BackgroundLaboratory Project:21-0525Field Sample ID:MW-15002Collect Date:05/03/2021Lab Sample ID:21-0525-01Collect Time:02:00 PMMatrix:GroundwaterCollect Time:02:00 PM

Alkalinity by SM 2320B			Aliquot: 2	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



### Sample Site:DEK JCW BackgroundLaboratory Project:21-0525Field Sample ID:MW-15008Collect Date:05/03/2021Lab Sample ID:21-0525-02Collect Time:03:56 PMMatrix:GroundwaterCollect Time:03:56 PM

arameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Mercury	ND	g	ug/L	0.2	05/12/2021	AB21-0512-1
etals by EPA 6020B: CCR Rule	Appendix III-IV To	tal Metals	-	Aliquot:	21-0525-02-C01-A02	Analyst: El
arameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Antimony	ND		ug/L	1	05/13/2021	AB21-0514-0
Arsenic	ND		ug/L	1	05/13/2021	AB21-0514-0
Barium	62		ug/L	5	05/13/2021	AB21-0514-0
Beryllium	ND		ug/L	1	05/13/2021	AB21-0514-0
Boron	121		ug/L	20	05/13/2021	AB21-0514-0
Cadmium	ND		ug/L	0.2	05/13/2021	AB21-0514-0
Calcium	105000		ug/L	1000	05/14/2021	AB21-0514-0
Chromium	ND		ug/L	1	05/13/2021	AB21-0514-0
Cobalt	ND		ug/L	6	05/13/2021	AB21-0514-0
Copper	1		ug/L	1	05/13/2021	AB21-0514-0
Iron	11300		ug/L	20	05/13/2021	AB21-0514-0
Lead	ND		ug/L	1	05/13/2021	AB21-0514-0
Lithium	15		ug/L	10	05/13/2021	AB21-0514-0
Magnesium	15500		ug/L	1000	05/14/2021	AB21-0514-0
Molybdenum	ND		ug/L	5	05/13/2021	AB21-0514-0
Nickel	ND		ug/L	2	05/13/2021	AB21-0514-0
Potassium	2450		ug/L	100	05/14/2021	AB21-0514-0
Selenium	ND		ug/L	1	05/13/2021	AB21-0514-0
Silver	ND		ug/L	0.2	05/13/2021	AB21-0514-0
Sodium	167000		ug/L	1000	05/14/2021	AB21-0514-0
Thallium	ND		ug/L	2	05/13/2021	AB21-0514-0
Vanadium	8		ug/L	2	05/13/2021	AB21-0514-0
Zinc	ND		ug/L	10	05/13/2021	AB21-0514-0

AIIIOIIS BY LEA 300.0 CCK Kule Allaly		-131, 01, 1 , 304, Aqueous			Allquot: 21-0525-02-C02-A01		
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				Aliquetu	01 0525 02 002 401	Analysty CET	

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



# Sample Site:DEK JCW BackgroundLaboratory Project:21-0525Field Sample ID:MW-15008Collect Date:05/03/2021Lab Sample ID:21-0525-02Collect Time:03:56 PMMatrix:GroundwaterCollect 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	



### Sample Site:DEK JCW BackgroundLaboratory Project:21-0525Field Sample ID:MW-15016Collect Date:05/03/2021Lab Sample ID:21-0525-03Collect Time:03:09 PMMatrix:GroundwaterCollect Time:03:09 PM

Mercury by EPA 7470A, Tot	tal, 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 To	tal 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
Ounate	20000		ug/L	1000	00/11/2021	AB2 1-0000

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



# Sample Site:DEK JCW BackgroundLaboratory Project:21-0525Field Sample ID:MW-15016Collect Date:05/03/2021Lab Sample ID:21-0525-03Collect Time:03:09 PMMatrix:GroundwaterCollect Time:03:09 PM

Alkalinity by SM 2320B			Aliquot: 2	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



Sodium

Thallium

Zinc

Vanadium

### Sample Site:DEK JCW BackgroundLaboratory Project:21-0525Field Sample ID:MW-15019Collect Date:05/03/2021Lab Sample ID:21-0525-04Collect Time:04:03 PMMatrix:GroundwaterGroundwaterGroundwaterGroundwater

Mercury by EPA 7470A, To	Mercury by EPA 7470A, Total, Aqueous				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: CCF	R Rule Appendix III-IV To	tal 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
			-			

Result	Flag	Units	•		Tracking #
344000		ug/L	1000	05/17/2021	AB21-0506-07
ND		ug/L	1000	05/06/2021	AB21-0506-07
52400		ug/L	1000	05/06/2021	AB21-0506-07
M 2540C			Aliquot:	21-0525-04-C03-A01	Analyst: CE
	Result 344000 ND 52400	Result         Flag           344000         ND           52400	344000 ug/L ND ug/L 52400 ug/L	Result         Flag         Units         RL           344000         ug/L         1000           ND         ug/L         1000           52400         ug/L         1000	Result         Flag         Units         RL         Analysis Date           344000         ug/L         1000         05/17/2021           ND         ug/L         1000         05/06/2021           52400         ug/L         1000         05/06/2021

ug/L

ug/L

ug/L

ug/L

1000

2

2

10

05/14/2021

05/13/2021

05/13/2021

05/13/2021

AB21-0514-08

AB21-0514-08

AB21-0514-08

AB21-0514-08

224000

ND

ND

4

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



### Sample Site:DEK JCW BackgroundLaboratory Project:21-0525Field Sample ID:MW-15019Collect Date:05/03/2021Lab Sample ID:21-0525-04Collect Time:04:03 PMMatrix:GroundwaterCollect Time:04:03 PM

Alkalinity by SM 2320B			Aliquot: 2	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



### Sample Site:DEK JCW BackgroundLaboratory Project:21-0525Field Sample ID:DUP-04Collect Date:05/03/2021Lab Sample ID:21-0525-05Collect Time:12:00 AMMatrix:GroundwaterGroundwaterGroundwaterGroundwater

	B	-	11.24			<b>T</b>
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 To	tal 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, CI, 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

Total Dissolved Solids by Sivi 25400			Aliqu	ot: 21-0525-05-003-A01	Analyst: CET
Parameter(s)	Result	Flag Uni	ts RL	Analysis Date	Tracking #
Total Dissolved Solids	5330	mg/	L 10	05/07/2021	AB21-0507-02



# Sample Site:DEK JCW BackgroundLaboratory Project:21-0525Field Sample ID:DUP-04Collect Date:05/03/2021Lab Sample ID:21-0525-05Collect Time:12:00 AMMatrix:GroundwaterCollect Time:12:00 AM

Alkalinity by SM 2320B	Aliquot: 2	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



### Sample Site:DEK JCW BackgroundLaboratory Project:21-0525Field Sample ID:FB-04Collect Date:05/03/2021Lab Sample ID:21-0525-06Collect Time:04:03 PMMatrix:WaterVaterVaterVater

Mercury by EPA 7470A, To					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: CCF	Rule Appendix III-IV To	otal 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. Aau	eous	Aliquot:	21-0525-06-C02-A01	Analyst: DMW
Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #

					21-0323-00-002-A01	Analyst. Diviv
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

No exceptions occured.

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

Inspection Date:	5/05/21		Inspection By: <u>C</u> U	+	<u>.</u>
Sample Origin/Project Na	me: <u>Klu</u>	1 Back	ground		
Shipment Delivered By: E			<i>,</i>		
Pony	FedEx 🖌	UPS	USPS	Airb	orne
Other/Hand Carry					
Tracking Number:	786769	796241	Shipping Form A	Attached: Yes 🛌	No
Shipping Containers: Ent	er the type and	l number of shi	pping containers received	1.	
Cooler(1)	Cardboard ]	Box	Custom Case	_ Envelope	e/Mailer
Loose/Unpackaged	Containers		Other		
Condition of Shipment: E	nter the as-rec	eived conditior	of the shipment contain	er.	
-			Dented		king
Other					
Shipment Security: Enter				againt	
	-		-		
Shipping Container	s Received: (	Opened	Sealed		
Enclosed Documents: Ente	er the type of a	locuments encl	osed with the shipment.		
CoC <u>&lt;</u>	Work Request	<u> </u>	Air Data Sheet	Other	
Temperature of Container	s: Measure th	e temperature o	f several sample contain	ers.	
-		-	c Samples Received		lo
_					
M&TE # and Expir		1.21			
Number and Type of Cont	ainers: Enter	the total numb	er of sample containers r	eceived.	
<u>Container Type</u>	Water	<u>Soil</u>	Other	Broken	<u>Leakin</u>
VOA (40mL or 60m	<u>10</u>		<u> </u>		
Quart/Liter (g/p)			<u> </u>		
9-oz (amber glass j	ar)	<u> </u>	<u></u>		
2-oz (amber glass)					
125 mL (plastic)	12	. <u> </u>			
24 mL vial (glass)	L			<u> </u>	<u> </u>
<b>150.50</b> 0 mL (plastic)	5				<u></u>
Other					

PG. 23 2not needed

### **CHAIN OF CUSTODY**

### **CONSUMERS ENERGY COMPANY – LABORATORY SERVICES**

### **Consumers Energy**

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

SAMP	LING SIT	E			PROJECT NUMBER				ANALYSIS REQUESTED					Page 1 of 1			
DEK	& JCW	Backgrou	nd- 2021 Q2	RCRA		21-052	25										SEND REPORT TO CDBatts
SAMP	LING TEA	λM			DATE SHIPPED	SITE SKETCHED ATTACHED?			als						1		HD Register, TRC
		TRC			5-4-21	CIRCLE ONE		Total Metals	Anions		Alkalınity					PHONE	
CON	CE TROL #	SAMPLE DATE	SAMPLE TIME	SAMPLE MATRIX	SAMPLE DESCRIPTION	/LOCATION	DEPTH v (ft)	# OF CONTAINERS	Tot	Ani	SUT	Alk					REMARKS
21-0	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-Backgrown	d		1	x	x							
														-			
						_											
RELIN				BY (SIGNATUR	E)		1	L		I	COM	IMENT	'S	0.3-1.6°C			
	In	Ind Ky 5-4-21/1630 Feder			015402												
RELIN	<b>I</b> QUISHEI	DBY (SIGNA	TURE)	DATE/T			BY (SIGNATUR		1								
	Fe	DBY (SIGNA DEY (SIGNA		5.5	5-21 1100	Ctse	ERita	Nsen			0	RIGINA	AL TO	LAB	COP	Y TO	CUSTOMER

21-0525 Page 18 of 18



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

135 W. Trail St.

Jackson, MI 49201

### **Chemistry Project: 21-0528**

*phone* 517-788-1251 *fax* 517-788-2533

TRC Environmental, Inc. conducted groundwater monitoring at the DEKarn Bottom Ash Pond Wells area on 05/03/2021 for the 2<sup>nd</sup> 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 accredidation 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, 22<sup>nd</sup> Edition, 2012.

#### III. <u>Results/Quality Control</u>

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:

Acronym	Description
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>	Description
*	Generic data flag, applicable description added in the corresponding notes section
В	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
Η	The maximum recommended hold time was exceeded
Ι	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
Μ	The precision for duplicate analysis was not met; RPD outside acceptance criteria
Ν	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
Х	Other notation required; comment listed in sample notes and/or case narrative



# Customer Name:Karn/Weadock ComplexWork Order ID:Q2-2021 DEK RCRA Bottom Ash Pond WellsDate Received:5/5/2021Chemistry Project:21-0528

<u>Sample #</u>	Field Sample ID	<u>Matrix</u>	Sample Date	<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



### Sample Site:DEK Bottom Ash PondLaboratory Project:21-0528Field Sample ID:DEK-MW-15002Collect Date:05/03/2021Lab Sample ID:21-0528-01Collect Time:01:08 PMMatrix:GroundwaterCollect Time:01:08 PM

Mercury by EPA 7470A, Tot					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 To	tal 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, CI, 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	25400			Allansati	04 0500 04 000 404	

Total Dissolved Solids by SM 2540C			Aliquot:	Analyst: CET		
Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking #
Total Dissolved Solids	926		mg/L	10	05/07/2021	AB21-0507-02



#### Sample Site: **DEK Bottom Ash Pond** Laboratory Project: 21-0528 Field Sample ID: DEK-MW-15002 Collect Date: 05/03/2021 Lab Sample ID: 21-0528-01 Collect Time: 01:08 PM Matrix: Groundwater

Alkalinity by SM 2320B			Aliquot: 2	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

Metals by EPA 6020B: CCF	als 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



Thallium

Zinc

Vanadium

### Sample Site:DEK Bottom Ash PondLaboratory Project:21-0528Field Sample ID:DEK-MW-15004Collect Date:05/03/2021Lab Sample ID:21-0528-02Collect Time:02:10 PMMatrix:GroundwaterCollect Date:02:10 PM

Mercury by EPA 7470A, To	tal, 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 To	otal Metals	Expand	Aliquot:	21-0528-02-C01-A02	Analyst: EE
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	AB21-0514-0
Calcium	60200		ug/L	1000	05/14/2021	AB21-0514-0
Chromium	ND		ug/L	1	05/13/2021	AB21-0514-0
Cobalt	ND		ug/L	6	05/13/2021	AB21-0514-0
Copper	ND		ug/L	1	05/13/2021	AB21-0514-0
Iron	1980		ug/L	20	05/13/2021	AB21-0514-0
Lead	ND		ug/L	1	05/13/2021	AB21-0514-0
Lithium	34		ug/L	10	05/13/2021	AB21-0514-08
Magnesium	10600		ug/L	1000	05/14/2021	AB21-0514-0
Molybdenum	11		ug/L	5	05/13/2021	AB21-0514-08
Nickel	ND		ug/L	2	05/13/2021	AB21-0514-0
Potassium	4630		ug/L	100	05/14/2021	AB21-0514-08
Selenium	ND		ug/L	1	05/13/2021	AB21-0514-0
Silver	ND		ug/L	0.2	05/13/2021	AB21-0514-0
Sodium	85700		ug/L	1000	05/14/2021	AB21-0514-08

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

ug/L

ug/L

ug/L

2

2

10

05/13/2021

05/13/2021

05/13/2021

AB21-0514-08

AB21-0514-08

AB21-0514-08

ND

ND

ND

Total Dissolved Solids by SM 2540C			Aliqu	ot: 21-0528-02-C03-A01	Analyst: CET
Parameter(s)	Result	Flag Uni	ts RL	Analysis Date	Tracking #
Total Dissolved Solids	493	mg/	L 10	05/07/2021	AB21-0507-02



Alkalinity Bicarbonate

Alkalinity Carbonate

21-0528

05/03/2021

AB21-0511-11

AB21-0511-11

02:10 PM

#### Sample Site: **DEK Bottom Ash Pond** Laboratory Project: Field Sample ID: DEK-MW-15004 Collect Date: Lab Sample ID: 21-0528-02 Collect Time: Matrix: Groundwater

152000

ND

Alkalinity by SM 2320B				Aliquot: 2	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

10000

10000

05/11/2021

05/11/2021

ug/L

ug/L

21-0528	Page	8	of	18



### Sample Site:DEK Bottom Ash PondLaboratory Project:21-0528Field Sample ID:DEK-MW-15005Collect Date:05/03/2021Lab Sample ID:21-0528-03Collect Time:11:35 AMMatrix:GroundwaterCollect Date:05/03/2021

Mercury by EPA 7470A, Tot	al, Aqueous			Aliquot:	21-0528-03-C01-A01	Analyst: TMF
Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Mercury	ND		ug/L	0.2	05/12/2021	AB21-0512-1
Metals by EPA 6020B: CCR	Rule Appendix III-IV To	otal Metals	Expand	Aliquot:	21-0528-03-C01-A02	Analyst: EE
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	AB21-0514-0
Boron	926		ug/L	20	05/13/2021	AB21-0514-0
Cadmium	ND		ug/L	0.2	05/13/2021	AB21-0514-0
Calcium	95600		ug/L	1000	05/14/2021	AB21-0514-0
Chromium	ND		ug/L	1	05/13/2021	AB21-0514-0
Cobalt	ND		ug/L	6	05/13/2021	AB21-0514-0
Copper	1		ug/L	1	05/13/2021	AB21-0514-0
Iron	421		ug/L	20	05/13/2021	AB21-0514-0
Lead	ND		ug/L	1	05/13/2021	AB21-0514-0
Lithium	38		ug/L	10	05/13/2021	AB21-0514-0
Magnesium	14300		ug/L	1000	05/14/2021	AB21-0514-0
Molybdenum	8		ug/L	5	05/13/2021	AB21-0514-0
Nickel	3		ug/L	2	05/13/2021	AB21-0514-0
Potassium	6550		ug/L	100	05/14/2021	AB21-0514-0
Selenium	1		ug/L	1	05/13/2021	AB21-0514-0
Silver	ND		ug/L	0.2	05/13/2021	AB21-0514-0
Sodium	67500		ug/L	1000	05/14/2021	AB21-0514-0
Thallium	ND		ug/L	2	05/13/2021	AB21-0514-0
Vanadium	ND		ug/L	2	05/13/2021	AB21-0514-0
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

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



21-0528

05/03/2021

11:35 AM

### Sample Site:DEK Bottom Ash PondLaboratory Project:Field Sample ID:DEK-MW-15005Collect Date:Lab Sample ID:21-0528-03Collect Time:Matrix:GroundwaterCollect Time:

Alkalinity by SM 2320B			Aliquot: 2	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



Zinc

### Sample Site:DEK Bottom Ash PondLaboratory Project:21-0528Field Sample ID:DEK-MW-15006Collect Date:05/03/2021Lab Sample ID:21-0528-04Collect Time:10:25 AMMatrix:GroundwaterCollect Date:05/03/2021

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: CCF	R Rule Appendix III-IV To	tal 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

Anions by EPA 300.0 CCR Rule Analyte List, CI, 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 254	0C			Aliquot	21-0528-04-C03-A01	Analyst: CET

ug/L

10

05/13/2021

AB21-0514-08

ND

Total Dissolved Solids by SM 2540C				ot: 21-0528-04-C03-A01	Analyst: CET
Parameter(s)	Result	Flag Units	s RL	Analysis Date	Tracking #
Total Dissolved Solids	790	mg/L	10	05/07/2021	AB21-0507-02



21-0528

#### Sample Site: **DEK Bottom Ash Pond** Laboratory Project: Field Sample ID: DEK-MW-15006 Collect Date: 05/03/2021 Lab Sample ID: 21-0528-04 Collect Time: 10:25 AM Matrix: Groundwater

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



# Sample Site:DEK Bottom Ash PondLaboratory Project:21-0528Field Sample ID:DUP-DEK-BAPCollect Date:05/03/2021Lab Sample ID:21-0528-05Collect Time:12:00 AMMatrix:GroundwaterCollect 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 Ru	Ile Appendix III-IV To	otal 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	21-0528-05-002-0.01	Applyst: CET

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	



21-0528

05/03/2021

12:00 AM

# Sample Site:DEK Bottom Ash PondLaboratory Project:Field Sample ID:DUP-DEK-BAPCollect Date:Lab Sample ID:21-0528-05Collect Time:Matrix:GroundwaterCollect Time:

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	



# Sample Site:DEK Bottom Ash PondLaboratory Project:21-0528Field Sample ID:FB-DEK-BAPCollect Date:05/03/2021Lab Sample ID:21-0528-06Collect Time:11:35 AMMatrix:WaterVaterVaterVater

Mercury by EPA 7470A, Total, Aqueous					Aliquot: 21-0528-06-C01-A01	
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 Rul	e Appendix III-IV To	otal 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

No exceptions occured.

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: <u>21-0528</u>	
Inspection Date: 050521	Inspection By: <u></u>
Sample Origin/Project Name: BAP DE	K
Shipment Delivered By: Enter the type of shipment of	carrier.
Pony FedEx U	PS USPS Airborne
Other/Hand Carry (whom)	
Tracking Number: 794749794230	Shipping Form Attached: Yes 🖌 No
Shipping Containers: Enter the type and number of s	shipping containers received.
Cooler (	Custom Case Envelope/Mailer
Loose/Unpackaged Containers	Other
Condition of Shipment: Enter the as-received condition	ion of the shipment container.
Damaged Shipment Observed: None	Dented Leaking
Other	
Chinmont Committy Enter if any of the chinning cont	inors were enand hefere resolut
Shipment Security: Enter if any of the shipping conta	
Shipping Containers Received: Opened	Sealed
Enclosed Documents: Enter the type of documents er	closed with the shipment.
CoC <u>V</u> Work Request	Air Data Sheet Other
Temperature of Containers: Measure the temperature	e of several sample containers.
As-Received Temperature Range 0. 2 -1.4	Samples Received on Ice: Yes V No
• • • • • • • • • • • • • • • • • • • •	
M&TE # and Expiration $06412$ 1.4.21 Number and Type of Containers: Enter the total num	_
Number and Type of Containers: Enter the total num	nber of sample containers received.
Container Type Water Soil	Other Broken Leaking
VOA (40mL or 60mL) <u>[D</u>	
Quart/Liter (g/p)	
9-oz (amber glass jar)	
2-oz (amber glass)	
125 mL (plastic) <u>11+1</u> =12	
24  mL vial (glass)	
Other	

PG. 292 not needed

# **CHAIN OF CUSTODY**

**Consumers Energy** 

# **CONSUMERS ENERGY COMPANY – LABORATORY SERVICES**

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

SEND REPORT TO CDBatts
PHONE
REMARKS
0.7.1.44
0.2-1.40
O CUSTOMER



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

135 W. Trail St.

Jackson, MI 49201

#### **Chemistry Project: 21-0529**

phone 517-788-1251

fax 517-788-2533

TRC Environmental, Inc. conducted groundwater monitoring at the DEKarn Bottom Ash Pond and Lined Impoundment Wells area on 05/03/2021, for the 2<sup>nd</sup> 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 accredidation 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, 22<sup>nd</sup> Edition, 2012.

#### III. <u>Results/Quality Control</u>

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:

Acronym	Description
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>	Description
*	Generic data flag, applicable description added in the corresponding notes section
В	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
Н	The maximum recommended hold time was exceeded
Ι	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
Μ	The precision for duplicate analysis was not met; RPD outside acceptance criteria
Ν	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
Х	Other notation required; comment listed in sample notes and/or case narrative



# Customer Name:Karn/Weadock ComplexWork Order ID:Q2-2021 DEK RCRA Bottom Ash Pond & Lined ImpoundmentDate Received:5/5/2021Chemistry Project:21-0529

Sample #	Field Sample ID	Matrix	Sample Date	<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



Sample Site:	DEK Bottom Ash Pond & Lined Impoundment	Laboratory Project:	21-0529
Field Sample ID:	DEK-MW-15003	Collect Date:	05/03/2021
Lab Sample ID:	21-0529-01	Collect Time:	12:33 PM
Matrix:	Groundwater		

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 R	ule Appendix III-IV To	tal 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



Sample Site:	DEK Bottom Ash Pond & Lined Impoundment	Laboratory Project:	21-0529
Field Sample ID:	DEK-MW-15003	Collect Date:	05/03/2021
Lab Sample ID:	21-0529-01	Collect Time:	12:33 PM
Matrix:	Groundwater		

Alkalinity by SM 2320B				Aliquot: 21-0529-01-C04-A01		
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	

21-0529 Page 6 of 13



Sample Site:	DEK Bottom Ash Pond & Lined Impoundment	Laboratory Project:	21-0529
Field Sample ID:	DEK-MW-18001	Collect Date:	05/03/2021
Lab Sample ID:	21-0529-02	Collect Time:	11:28 AM
Matrix:	Groundwater		

Mercury by EPA 7470A, T	otal, Aqueous			Aliquot: 2	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: CC	R Rule Appendix III-IV Tota	al Metals	Expand	Aliquot: 2	1-0529-02-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



Sample Site:	DEK Bottom Ash Pond & Lined Impoundment	Laboratory Project:	21-0529
Field Sample ID:	DEK-MW-18001	Collect Date:	05/03/2021
Lab Sample ID:	21-0529-02	Collect Time:	11:28 AM
Matrix:	Groundwater		

Alkalinity by SM 2320B			Aliquot:	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



Sample Site:	DEK Bottom Ash Pond & Lined Impoundment	Laboratory Project:	21-0529
Field Sample ID:	DEK-MW-18001 MS	Collect Date:	05/03/2021
Lab Sample ID:	21-0529-03	Collect Time:	11:28 AM
Matrix:	Groundwater		

Mercury by EPA 7470A, Total, Aqueon	us			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 App	endix III-IV To	otal 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, CI, F,	SO4, Aqu	ieous	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 #

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



Alkalinity Total

AB21-0511-11

Sample Site:	DEK Bottom Ash Pond & Lined Impoundment	Laboratory Project:	21-0529
Field Sample ID:	DEK-MW-18001 MSD	Collect Date:	05/03/2021
Lab Sample ID:	21-0529-04	Collect Time:	11:28 AM
Matrix:	Groundwater		

Mercury by EPA 7470A, T	otal, 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: CC	R Rule Appendix III-IV To	otal 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
-						

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, CI, F,	SO4, Aqu	eous	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 #

96

%

10000

05/11/2021



Data Qualifiers

Exception Summary

No exceptions occured.

Chemistry Department

General Standard Operating Procedure

1

### TITLE: SAMPLE LOG-IN - SHIPMENT INSPECTION FORM

		1		
Project Log-In Number:	21-0529	Inspection By: UIT		
Inspection Date: 5	15/21	Inspection By: UI+	<u> </u>	<u></u>
		+		
Shipment Delivered By: Ente	er the type of shipmer	nt carrier.		
Pony	FedEx 🖌	UPS USPS	Airb	ome
Tracking Number: 79	3676979624	Shipping Form Atta	ched:Yes 🖌	No
Shipping Containers: Enter f	the type and number of	of shipping containers received.		
Cooler $(1)$			Fnvelope	-/Mailer
Loose/Unpackaged C				
• -				
•		dition of the shipment container.		
		Dented	Leal	cing
Other	<u></u>			
		ntainers were opened before rece		
Shipping Containers I	Received: Opened	Sealed		
Enclosed Documents: Enter t				
,		Air Data Sheet	Other	
	-		. 0000	
Temperature of Containers:	Measure the temperat	ure of several sample containers		
As-Received Tempera	iture Range 0.3 · ( ·	Samples Received on I	Ice: Yes 🖌 N	o
M&TE # and Expirati	on 015402			
Number and Type of Contair	1.4.21	number of sample containers rece	ived	
				Т <b>1-1</b>
<u>Container Type</u> VOA (40mL or(60mL)	<u>Water</u> <u>Soil</u>	Other	<u>Broken</u>	<u>Leaking</u>
Quart/Liter (g/p)		······································		
9-oz (amber glass jar)		<u> </u>	···-	······································
2-oz (amber glass)		<u> </u>		<u></u>
125 mL (plastic)	8	<u>.</u>		<u></u>
24 mL vial (glass)		······		
روستان (grass) عن المروم عن المروم (grass) عن المروم (grass) عن المروم (grass) من (grass) مم (grass) من (grass) من (grass) من (gra	<u> </u>			
Other				

21-0529 Page 12 of 13

PE-2g2 not niedid

# **CHAIN OF CUSTODY**

# **CONSUMERS ENERGY COMPANY – LABORATORY SERVICES**

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

**Consumers Energy** 

SAMP	LING S	ITE				PROJECT NUMBER							ANAL	YSIS F	REQUE	ESTED			Page 1 of 1
DE	K Bot	tom As	sh Pond	& LI – 202	1 Q2		21-0:	529											SEND REPORT TO CDBatts
SAMP	LING	EAM				DATE SHIPPED		SITE		O ATTACHED?	ls								HD Register, TRC
			T	lC		5-4-21			CIRCLE	NO	Total Metals	Anions	-	Alkalınıty					PHONE
CON	CE TROL	# SA	AMPLE DATE	SAMPLE TIME	SAMPLE MATRIX	SAMPLE DESCRIPTIO	N / LOCATI	ON	DEPTH (ft)	# OF CONTAINERS	Tota	Ani	TDS	Alk					REMARKS
21-	0529-	01 <b>S-</b>	-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 1	MS			4	x	x		x					
	¥ -	04 5-	3-21	1128	GW	DEK-MW-18001 1	MSD			4	x	x		x					
												_							
												-							
RELD	QUISI	IED BY	(SIGNA)	TURE)	DATE/T	IME 1			(SIGNATUR	E)	<u> </u>	L	<u> </u>	I	<u> </u>	COM	IMENT	'S	0-3-1.6°C
	1	l	, U	~	5-	4-21/1630	F	ide	X										015402
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21-0529 Page 13 of 13

# 🔅 eurofins

# Environment Testing America

# **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

Brooks

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

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

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.

LINKS **Review your project** results through Total Access Have a Question? Ask-The Expert Visit us at: www.eurofinsus.com/Env

# **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

## Qualifiers

Qualifiers		3
Rad		
Qualifier	Qualifier Description	
U	Result is less than the sample detection limit.	
Glossary		5
Abbreviation	These commonly used abbreviations may or may not be present in this report.	6
¤	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	0
CNF	Contains No Free Liquid	Õ
DER	Duplicate Error Ratio (normalized absolute difference)	
Dil Fac	Dilution Factor	9
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)	13
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		
RER	Quality Control	
RL	Quality Control Relative Error Ratio (Radiochemistry)	
	Relative Error Ratio (Radiochemistry)	
RPD		
RPD TEF	Relative Error Ratio (Radiochemistry) Reporting Limit or Requested Limit (Radiochemistry)	
	Relative Error Ratio (Radiochemistry) Reporting Limit or Requested Limit (Radiochemistry) Relative Percent Difference, a measure of the relative difference between two points	

#### 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 160-510304/2-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 160-510305/2-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.

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

#### 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.

# **Method Summary**

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

Protocol	Laboratory	
EPA	TAL SL	
EPA	TAL SL	
TAL-STL	TAL SL	
None	TAL SL	
None	TAL SL	

Method	Method Description	Protocol	Labor
903.0	Radium-226 (GFPC)	EPA	TAL S
904.0	Radium-228 (GFPC)	EPA	TAL S
Ra226_Ra228	Combined Radium-226 and Radium-228	TAL-STL	TAL S
PrecSep STD	Preparation, Precipitate Separation (Standard In-Growth)	None	TAL S
PrecSep_0	Preparation, Precipitate Separation	None	TAL S
Protocol Ref	erences:		
EPA = US	Environmental Protection Agency		
None = No	pne		
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
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

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

Job ID: 240-149188-1

Lab Sample ID: 240-149188-1 Matrix: Water

Client Sample ID: MW-15002	
Date Collected: 05/03/21 14:00	
Date Received: 05/12/21 08:00	

			Count Uncert.	Total Uncert.						
Analyte	Result	Qualifier	(2 <b>σ+/-</b> )	(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

Analyte	Result	Qualifier	Uncert. (2σ+/-)	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

			Count	Total						
			Uncert.	Uncert.						
Analyte	Result (	Qualifier	(2 <b>σ+/-</b> )	(2 <b>σ+/-</b> )	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: TRC Environmental Corporation. Project/Site: Karn/Weadock CCR Background Wells

Job ID: 240-149188-1

Matrix: Water

Lab Sample ID: 240-149188-2

Client Sample ID: MW-15008 Date Collected: 05/03/21 15:56 Date Received: 05/12/21 08:00

			Count Uncert.	Total Uncert.						
Analyte	Result	Qualifier	(2σ+/-)	(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)

			Count Uncert.	Total Uncert.							
Analyte	Result	Qualifier	(2 <b>σ+/-</b> )	(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

			Count	Total						
			Uncert.	Uncert.						
Analyte	Result	Qualifier	(2 <b>σ+/-</b> )	(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

Eurofins TestAmerica, Canton

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

Job ID: 240-149188-1

Lab Sample ID: 240-149188-3 Matrix: Water

#### Client Sample ID: MW-15016 Date Collected: 05/03/21 15:09 Date Received: 05/12/21 08:00

Method: 903.0 -	Radium-226	(GFPC)								
			Count Uncert.	Total Uncert.						
Analyte	Result	Qualifier	(2σ+/-)	(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
	Radium-228	(GFPC)								
			Count	Total						
			Uncert.	Uncert.						
Analyte	Result	Qualifier	(2 <b>σ</b> +/-)	(2 <del>σ+/-</del> )	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

			Count	Total						
			Uncert.	Uncert.						
Analyte	Result	Qualifier	(2 <b>σ+/-</b> )	(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

Eurofins TestAmerica, Canton

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

Job ID: 240-149188-1

**Matrix: Water** 

Lab Sample ID: 240-149188-4

05/18/21 14:33 06/11/21 14:08

Client Sample ID: MW-15019 Date Collected: 05/03/21 16:03 Date Received: 05/12/21 08:00

Y Carrier

Date Received: 0	5/12/21 08:00	)								
Method: 903.0 -	Radium-226	(GFPC)								
			Count	Total						
			Uncert.	Uncert.						
Analyte	Result	Qualifier	(2 <b>σ+/-</b> )	(2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fa
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	
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fa
Ba Carrier	71.8		40 - 110					05/18/21 13:46	06/14/21 21:18	
	Radium-228	(GFPC)								
			Count	Total						
			Uncert.	Uncert.						
Analyte	Result	Qualifier	(2σ+/-)	(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 Fa
Ba Carrier	71.8		40 - 110					05/18/21 14:33	06/11/21 14:08	-

#### Method: Ra226\_Ra228 - Combined Radium-226 and Radium-228

40 - 110

89.3

			Count	Total						
			Uncert.	Uncert.						
Analyte	Result	Qualifier	(2 <b>σ+/-</b> )	(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

Eurofins TestAmerica, Canton

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

#### Job ID: 240-149188-1

Lab Sample ID: 240-149188-5 Matrix: Water

Client Sample ID: DUP-BACKGR	OUND		
Date Collected: 05/03/21 00:00			
Date Received: 05/12/21 08:00			
	Count	Total	
	Uncert.	Uncert.	

			Uncert.	Uncert.						
Analyte	Result	Qualifier	(2 <b>σ+/-</b> )	(2 <b>σ+/-</b> )	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)

			Count Uncert.	Total Uncert.							
Analyte	Result	Qualifier	(2σ+/-)	(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

			Count	Total						
			Uncert.	Uncert.						
Analyte	Result	Qualifier	(2 <b>σ+/-</b> )	(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

Eurofins TestAmerica, Canton

#### 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) Total Count Uncert. Uncert. Analyte **Result Qualifier** (2**σ**+/-) (2**σ**+/-) RL MDC Unit Prepared Analyzed 05/18/21 13:46 06/14/21 21:19 Radium-226 -0.0247 U 0.0896 0.0897 0.187 pCi/L 1.00

	0.0211 0	0.0000	0.0001	1.00	0.101 p0#2	00/10/21 10:10	00/11/21/21:10	•	
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 - Rad	ium-228 (GFPC)								ł

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analvzed	Dil Fac	
Radium-228	0.206		0.284	0.285	1.00	0.474		05/18/21 14:33		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

			Count	Total							ŝ
			Uncert.	Uncert.							
Analyte	Result	Qualifier	(2 <b>σ+/-</b> )	(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	

Dil Fac

1

## **Tracer/Carrier Summary**

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

Prep Type: Total/NA

#### Method: 903.0 - Radium-226 (GFPC) Matrix: Water

_			Percent Yield (Acceptance Limits)	
		Ва		
Lab Sample ID	Client Sample ID	(40-110)		5
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		8
LCS 160-510304/1-A	Lab Control Sample	82.0		U
LCSD 160-510304/2-A	Lab Control Sample Dup	87.1		0
MB 160-510304/22-A	Method Blank	86.8		3
Tracer/Carrier Legend	I			

Ba = Ba Carrier

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

Matrix: Water

				Percent Yield (Acceptance Limits)
		Ва	Y	
Lab Sample ID	Client Sample ID	(40-110)	(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)

Carrier

Ba Carrier

Y Carrier

%Yield Qualifier

86.8

84.9

Limits

40 - 110

40 - 110

	e ID: MB 1	60-5103	04/22-A						Client Sam	ole ID: Metho	
Matrix: Wate										Prep Type: 7	
Analysis Ba	atch: 5142	96								Prep Batch:	510304
				Count	Total						
		MB		Uncert.	Uncert.						
Analyte			Qualifier	(2σ+/-)	(2σ+/-)	RL	MDC		Prepared	Analyzed	Dil Fac
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
		MB	МВ								
Carrier		%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier		86.8		40 - 110					05/18/21 13:46	06/15/21 07:09	
Lab Sample	D: LCS	160-510	304/1-A					Cli	ent Sample ID:	Lab Control	Sample
Matrix: Wate									•	Prep Type: 7	
Analysis Ba	atch: 5142	48								Prep Batch:	
						Total					
			Spike	LCS	LCS	Uncert.				%Rec.	
Analyte			Added	Result	Qual	(2 <b>σ+/-</b> )	RL	MDC	Unit %Rec	Limits	
Radium-226			11.3	10.88		1.21	1.00	0.208	pCi/L 96	75 - 125	
	201	LCS									
Carrier		Qualifier	Limits								
		Qualifier	Limits	-							
Ba Carrier	% <b>Yield</b> 82.0		40 - 110	-				Client S	ample ID: Lab	Control Sam	nlo Dur
Ba Carrier Lab Sample	%Yield 82.0 B ID: LCSE		40 - 110	-				Client S	ample ID: Lab		
Ba Carrier Lab Sample Matrix: Wate	%Yield 82.0 1D: LCSE er	0 160-51	40 - 110	-				Client S	ample ID: Lab	Prep Type: 7	Total/NA
Ba Carrier Lab Sample Matrix: Wate	%Yield 82.0 1D: LCSE er	0 160-51	40 - 110	-		Total		Client S	ample ID: Lab		Total/NA
Ba Carrier Lab Sample Matrix: Wate	%Yield 82.0 1D: LCSE er	0 160-51	40 - 110 0304/2-A	LCSD	LCSD	Total Uncert.		Client S	ample ID: Lab	Prep Type: <sup>-</sup> Prep Batch:	fotal/NA 510304
<sup>Ba Carrier</sup> Lab Sample Matrix: Wate Analysis Ba	%Yield 82.0 1D: LCSE er	0 160-51	40 - 110 0304/2-A Spike	LCSD Result		Uncert.				Prep Type: <sup>-</sup> Prep Batch: %Rec.	Fotal/NA 510304 REF
Ba Carrier Lab Sample Matrix: Wate Analysis Ba Analyte	%Yield 82.0 1D: LCSE er	0 160-51	40 - 110 0304/2-A	LCSD <u>Result</u> 11.52			<b>RL</b> 1.00	Client S <u>MDC</u> 0.163	Unit %Rec	Prep Type: <sup>-</sup> Prep Batch:	Fotal/NA 510304 REF
Ba Carrier Lab Sample Matrix: Wate Analysis Ba Analyte	<u>%Yield</u> 82.0 e ID: LCSE er atch: 5142	0 160-51 48	40 - 110 0304/2-A Spike Added	Result		Uncert. (2σ+/-)	RL	MDC	Unit %Rec	Prep Type: Prep Batch: %Rec. Limits RE	Fotal/NA 510304 REF
Carrier Ba Carrier Lab Sample Matrix: Wate Analysis Ba Analyte Radium-226	<u>%Yield</u> 82.0 e ID: LCSE er atch: 5142 	0 160-51 48 	40 - 110 0304/2-A Spike Added 11.3	Result		Uncert. (2σ+/-)	RL	MDC	Unit %Rec	Prep Type: Prep Batch: %Rec. Limits RE	Fotal/NA 510304 REF
Ba Carrier Lab Sample Matrix: Wate Analysis Ba Analyte Radium-226 Carrier	%Yield 82.0 e ID: LCSE er atch: 5142 	0 160-51 48	40 - 110 0304/2-A Spike Added 11.3 Limits	Result		Uncert. (2σ+/-)	RL	MDC	Unit %Rec	Prep Type: Prep Batch: %Rec. Limits RE	Fotal/NA 510304 REF
Ba Carrier Lab Sample Matrix: Wate Analysis Ba Analyte Radium-226 Carrier	<u>%Yield</u> 82.0 e ID: LCSE er atch: 5142 	0 160-51 48 	40 - 110 0304/2-A Spike Added 11.3	Result		Uncert. (2σ+/-)	RL	MDC	Unit %Rec	Prep Type: Prep Batch: %Rec. Limits RE	Fotal/NA 510304 REF
Ba Carrier Lab Sample Matrix: Wate Analysis Ba Analyte Radium-226 Carrier Ba Carrier	<u>%Yield</u> 82.0 e ID: LCSE er atch: 5142 <u>LCSD</u> <u>%Yield</u> 87.1	0 160-51 48 LCSD Qualifier	40 - 110 0304/2-A Spike Added 11.3 Limits 40 - 110	Result 11.52		Uncert. (2σ+/-)	RL	MDC	Unit %Rec	Prep Type: Prep Batch: %Rec. Limits RE	Fotal/NA 510304 REF
Ba Carrier Lab Sample Matrix: Wate Analysis Ba Analyte Radium-226 Carrier Ba Carrier Iethod: 90	<u>%Yield</u> 82.0 e ID: LCSE er atch: 5142 <u>LCSD</u> <u>%Yield</u> 87.1 <b>)4.0 - Ra</b>	0 160-51 48 LCSD Qualifier dium-2	40 - 110 0304/2-A Spike Added 11.3 Limits 40 - 110 228 (GFPC	Result 11.52		Uncert. (2σ+/-)	RL	MDC	Unit %Rec pCi/L 102	Prep Type: 7 Prep Batch: %Rec. Limits RE 75-125 0.1	REF
Ba Carrier Lab Sample Matrix: Wate Analysis Ba Analyte Radium-226 Carrier Ba Carrier lethod: 90 Lab Sample	% Yield           82.0           e ID: LCSE           er           atch: 5142	0 160-51 48 LCSD Qualifier dium-2	40 - 110 0304/2-A Spike Added 11.3 Limits 40 - 110 228 (GFPC	Result 11.52		Uncert. (2σ+/-)	RL	MDC	Unit %Rec pCi/L 102	Prep Type: Prep Batch: %Rec. Limits RE 75 - 125 0.1	REF
Ba Carrier Lab Sample Matrix: Wate Analysis Ba Analyte Radium-226 Carrier Ba Carrier lethod: 90 Lab Sample Matrix: Wate	<u>% Yield</u> 82.0 e ID: LCSE er atch: 5142 <u>LCSD</u> <u>% Yield</u> 87.1 04.0 - Ra e ID: MB 1 er	0 160-51 48 <i>LCSD</i> <i>Qualifier</i> dium-2 60-5103	40 - 110 0304/2-A Spike Added 11.3 Limits 40 - 110 228 (GFPC	Result 11.52		Uncert. (2σ+/-)	RL	MDC	Unit %Rec pCi/L 102	Prep Type: Prep Batch: %Rec. Limits RE 75-125 0.3 Die ID: Methor Prep Type:	REF REF R Limi
Ba Carrier Lab Sample Matrix: Wate Analysis Ba Analyte Radium-226 Carrier Ba Carrier Iethod: 90 Lab Sample Matrix: Wate	<u>% Yield</u> 82.0 e ID: LCSE er atch: 5142 <u>LCSD</u> <u>% Yield</u> 87.1 04.0 - Ra e ID: MB 1 er	0 160-51 48 <i>LCSD</i> <i>Qualifier</i> dium-2 60-5103	40 - 110 0304/2-A Spike Added 11.3 Limits 40 - 110 228 (GFPC	Result 11.52	Qual	Uncert. (2σ+/-)	RL	MDC	Unit %Rec pCi/L 102	Prep Type: Prep Batch: %Rec. Limits RE 75 - 125 0.1	REF REF R Limi
Ba Carrier Lab Sample Matrix: Wate Analysis Ba Analyte Radium-226 Carrier Ba Carrier Iethod: 90 Lab Sample Matrix: Wate	<u>% Yield</u> 82.0 e ID: LCSE er atch: 5142 <u>LCSD</u> <u>% Yield</u> 87.1 04.0 - Ra e ID: MB 1 er	0 160-51 48 <i>LCSD</i> <i>Qualifier</i> dium-2 60-5103 70	40 - 110 0304/2-A Spike Added 11.3 Limits 40 - 110 228 (GFPC 05/22-A	Result 11.52	Qual	Uncert. (2σ+/-)	RL	MDC	Unit %Rec pCi/L 102	Prep Type: Prep Batch: %Rec. Limits RE 75-125 0.3 Die ID: Methor Prep Type:	REF
Ba Carrier Lab Sample Matrix: Wate Analysis Ba Analyte Radium-226 Carrier Ba Carrier Iethod: 90 Lab Sample Matrix: Wate Analysis Ba	<u>% Yield</u> 82.0 e ID: LCSE er atch: 5142 <u>LCSD</u> <u>% Yield</u> 87.1 04.0 - Ra e ID: MB 1 er	0 160-51 48 <i>LCSD</i> <i>Qualifier</i> dium-2 60-5103 70 MB	40 - 110 0304/2-A Spike Added 11.3 <u>Limits</u> 40 - 110 228 (GFPC 05/22-A MB	Result 11.52	Qual Total Uncert.	Uncert. (2σ+/-) 1.25	RL 1.00	<b>MDC</b> 0.163	Unit %Rec pCi/L 102	Prep Type: Prep Batch: %Rec. Limits 75-125 0.3 Die ID: Metho Prep Type: Prep Batch:	rotal/NA 510304 REF R Limi 20 d Blank Fotal/NA 510305
Ba Carrier Lab Sample Matrix: Wate Analysis Ba Analyte Radium-226 Carrier Ba Carrier Iethod: 90 Lab Sample Matrix: Wate	<u>% Yield</u> 82.0 e ID: LCSE er atch: 5142 <u>LCSD</u> <u>% Yield</u> 87.1 04.0 - Ra e ID: MB 1 er	0 160-51 48 <i>LCSD</i> <i>Qualifier</i> dium-2 60-5103 70 MB	40 - 110 0304/2-A Spike Added 11.3 <i>Limits</i> 40 - 110 228 (GFPC 05/22-A MB Qualifier	Result 11.52	Qual	Uncert. (2σ+/-)	RL	MDC 0.163	Unit %Rec pCi/L 102	Prep Type: Prep Batch: %Rec. Limits RE 75-125 0.3 Die ID: Methor Prep Type:	rotal/NA 510304 REF R Limi 20 d Blank Fotal/NA 510305

Eurofins TestAmerica, Canton

Analyzed

Prepared

05/18/21 14:33 06/11/21 14:18

05/18/21 14:33 06/11/21 14:18

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Job ID: 240-149188-1

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

Lab Sample Matrix: Wat	ter		5/1-A					Clie	ent Sar	nple ID:	Lab Con Prep Typ	be: Tot	al/NA	
Analysis Ba	atch: 5139	948				Total					Prep Ba	tch: 51	10305	
			Spike	LCS	LCS	Uncert.					%Rec.			Ē
Analyte			Added	Result	Qual	(2σ+/-)	RL	MDC	Unit	%Rec	Limits			
Radium-228			9.64	9.496		1.16	1.00	0.469	pCi/L	99	75 - 125			
	LCS	LCS												
Carrier		Qualifier	Limits											ï
Ba Carrier	82.0		40 - 110											
Y Carrier	89.3		40 - 110											- 2
	03.5		40 - 110											
Lab Sample	e ID: LCSI	D 160-5103						Client S	ample	ID: Lab	Control S			ļ
Lab Sample Matrix: Wat	e ID: LCSI ter							Client S	ample	ID: Lab	Prep Typ	be: Tot	al/NA	
Lab Sample	e ID: LCSI ter						(	Client S	ample	ID: Lab		be: Tot	al/NA	ļ
Lab Sample Matrix: Wat	e ID: LCSI ter		805/2-A			Total		Client S	ample	ID: Lab	Prep Typ Prep Ba	be: Tot	al/NA 10305	
Lab Sample Matrix: Wat Analysis Ba	e ID: LCSI ter		Spike	LCSD		Uncert.			-		Prep Typ Prep Ba %Rec.	be: Tot tch: 51	al/NA 10305 RER	
Lab Sample Matrix: Wat Analysis Ba Analyte	e ID: LCSI ter		Spike	Result		Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	Prep Typ Prep Ba %Rec. Limits	ce: Tot tch: 51	al/NA 10305 RER Limit	
Lab Sample Matrix: Wat Analysis Ba Analyte	e ID: LCSI ter		Spike			Uncert.		MDC	-		Prep Typ Prep Ba %Rec.	be: Tot tch: 51	al/NA 10305 RER	
Lab Sample Matrix: Wat	e ID: LCSI ter atch: 5139		Spike	Result		Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	Prep Typ Prep Ba %Rec. Limits	ce: Tot tch: 51	al/NA 10305 RER Limit	
Lab Sample Matrix: Wat Analysis Ba Analyte	e ID: LCSI ter atch: 5139 	948	Spike	Result		Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	Prep Typ Prep Ba %Rec. Limits	ce: Tot tch: 51	al/NA 10305 RER Limit	
Lab Sample Matrix: Wat Analysis Ba Analyte Radium-228	e ID: LCSI ter atch: 5139 	948 	Spike Added 9.64	Result		Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	Prep Typ Prep Ba %Rec. Limits	ce: Tot tch: 51	al/NA 10305 RER Limit	

# **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	
40-149188-2	MW-15008	Total/NA	Water	PrecSep STD	
40-149188-3	MW-15016	Total/NA	Water	PrecSep STD	
40-149188-4	MW-15019	Total/NA	Water	PrecSep STD	
40-149188-5	DUP-BACKGROUND	Total/NA	Water	PrecSep STD	
40-149188-6	FB-BACKGROUND	Total/NA	Water	PrecSep STD	
IB 160-510304/22-A	Method Blank	Total/NA	Water	PrecSep STD	
CS 160-510304/1-A	Lab Control Sample	Total/NA	Water	PrecSep STD	
CSD 160-510304/2-A	Lab Control Sample Dup	Total/NA	Water	PrecSep STD	
ep Batch: 510305					
ab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
					Пер Васел
	MW-15002	Total/NA	Water	PrecSep_0	
	MW-15002 MW-15008				
40-149188-2		Total/NA	Water	PrecSep_0	
40-149188-2 40-149188-3	MW-15008	Total/NA Total/NA	Water Water	PrecSep_0 PrecSep_0	
40-149188-2 40-149188-3 40-149188-4	MW-15008 MW-15016	Total/NA Total/NA Total/NA	Water Water Water	PrecSep_0 PrecSep_0 PrecSep_0	
40-149188-2 40-149188-3 40-149188-4 40-149188-5	MW-15008 MW-15016 MW-15019	Total/NA Total/NA Total/NA Total/NA	Water Water Water Water	PrecSep_0 PrecSep_0 PrecSep_0 PrecSep_0 PrecSep_0	
40-149188-2 40-149188-3 40-149188-4 40-149188-5 40-149188-6	MW-15008 MW-15016 MW-15019 DUP-BACKGROUND	Total/NA Total/NA Total/NA Total/NA Total/NA	Water Water Water Water Water	PrecSep_0 PrecSep_0 PrecSep_0 PrecSep_0 PrecSep_0	
240-149188-1 240-149188-2 240-149188-3 240-149188-4 240-149188-5 240-149188-6 MB 160-510305/22-A .CS 160-510305/1-A	MW-15008 MW-15016 MW-15019 DUP-BACKGROUND FB-BACKGROUND	Total/NA Total/NA Total/NA Total/NA Total/NA Total/NA	Water Water Water Water Water Water	PrecSep_0 PrecSep_0 PrecSep_0 PrecSep_0 PrecSep_0 PrecSep_0 PrecSep_0	

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

Job ID: 240-149188-1

Matrix: Water

**Matrix: Water** 

Matrix: Water

Lab Sample ID: 240-149188-1

Lab Sample ID: 240-149188-2

Lab Sample ID: 240-149188-3

## 2 3 4 5 6 7 8 9 10

Client Sample ID: MW-15002 Date Collected: 05/03/21 14:00 Date Received: 05/12/21 08:00

	Batch	Batch		Dilution	Batch	Prepared		
Prep Type	Туре	Method	Run	Factor	Number	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 Date Collected: 05/03/21 15:56 Date Received: 05/12/21 08:00

	Batch	Batch		Dilution	Batch	Prepared		
Prep Type	Туре	Method	Run	Factor	Number	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 Date Collected: 05/03/21 15:09 Date Received: 05/12/21 08:00

	Batch	Batch		Dilution	Batch	Prepared		
Prep Туре	Туре	Method	Run	Factor	Number	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 Date Collected: 05/03/21 16:03 Date Received: 05/12/21 08:00

#### Lab Sample ID: 240-149188-4 Matrix: Water

Batch Batch Dilution Batch Prepared Method Number or Analyzed Prep Type Туре Run Factor Analyst Lab Total/NA Prep PrecSep STD 510304 05/18/21 13:46 HRT TAL SL Total/NA Analysis 903.0 514232 06/14/21 21:18 SCB TAL SL 1 Total/NA 510305 05/18/21 14:33 MJ TAL SL Prep PrecSep\_0 Total/NA Analysis 904.0 1 513948 06/11/21 14:08 ANW TAL SL Total/NA TAL SL Analysis Ra226 Ra228 514477 06/15/21 21:24 GRW 1

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

#### Client Sample ID: DUP-BACKGROUND Date Collected: 05/03/21 00:00 Date Received: 05/12/21 08:00

	Batch	Batch		Dilution	Batch	Prepared		
Prep Type	Туре	Method	Run	Factor	Number	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 Date Collected: 05/03/21 16:03 Date Received: 05/12/21 08:00

	Batch	Batch		Dilution	Batch	Prepared		
Prep Type	Туре	Method	Run	Factor	Number	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

Job ID: 240-149188-1

## Lab Sample ID: 240-149188-5

Lab Sample ID: 240-149188-6

Matrix: Water

Matrix: Water

## Accreditation/Certification Summary

Client: TRC Environmental Corporation. Project/Site: Karn/Weadock CCR Background Wells Job ID: 240-149188-1

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	13

Laboratory:	Eurofins	TestAmerica,	St. Louis
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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
lowa	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

Eurofins TestAmerica, Canton						51D		MICHI	GANur		
North Canton, OH 44720 Phone: 330-497-9396 Fax: 330-497-0772	5	Chain c	nain of Custody Record De M	dy Re	cord (	111		19	190	Environment Testing America	10
Client Information	Sampler: Julye	Sere		Lab PM: Brooks, Kris M	Kris M	~	Car	Carrier Tracking No(s):	COC No: 240-825	COC No: 240-82579-29047.1	
Client Contact: Jacob Krenz	Phone: 734-	395 -	1026	E-Mail: Kris.Bro	E-Mail: Kris.Brooks@Eurofinset.com	nset.com	Stat	State of Origin:	Page 1 o	of 1	Γ
Company: TRC Environmental Corporation.			PWSID:			Ana	Analvsis Requested	sted	Job #:		
Address: 1540 Eisenhower Place	Due Date Requested:	ų							Preserva	Code	Γ
City Ann Arbor	TAT Requested (days)	ys):							A - HCL B - NaOH C - Zn Acetate		
State, Zip. Mi, 48108-7080	Compliance Project:	A Yes	a No		ST - 5 _				D - Nitric / E - NaHSO		
el) 734-971-9022(Fax)	Po# TBD			(1	-1				F - MeOH G - Amchlor H - Aerorhio Acid		
companies.com	#OM			01 NO						UC ACIO - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -	ŋ
Project Name: Karn/Weadock CCR Background Well	Project #: 24024154			6 (, 63	ъC ЭĞЧ				tainer L - EDA		
	SSOW#:			Iqma2	558 <sup>-</sup> CL				of con		
		Sample		Matrix (W=water, S=solid, O=waste/oli,	1-0, 1-0, 1-0, 1-0, 1-0, 1-0, 1-0, 1-0,				tal Number		
sample identification	Sample Date	Ime	Preservation Code	3						Special Instructions/Note:	
MVV-15002	5-3-21	1400	5	Water N	スン						T
MW -15008	12-2-5	1556	C	Water N	XXV						Τ
MW-15016	5-3-21	1509	C C	Water N	NN XX						
MW-15019	5-3-21	1603	5	Water N	N X X						
ounce Dup-Background	5-3-21	)	5	Water N	X X X		240-149	240-149188 Chain of Custody	stody		
FB- FB- Backgrown	12-2-5	1603	S	Water N	N X X			-	-		
			_	Water							
Possible Hazard Identification	on B		Radiological		Sample Di:	sposal ( A fe	e may be asse	assessed if samples	Sample Disposal ( A fee may be assessed if samples are retained longer than 1 month)	er than 1 month)	Τ
					Special Inst	ructions/QC	Special Instructions/QC Requirements:		D I DAILIDIU	STRICIN	Τ
Empty Kit Relinquished by:		Date:			Time:			Method of Shipment:			Γ
(har	Date/Time:	1/153	P Com	Company	Received by.	by / My	Mar	Date/Time	17/21	1545 Company ETA	,
Relinguished by Cold Shings	Date/Time Date/Time:	1545		Company Company	Received by Received by	Phillips		Date/Time: Date/Time:	72-21 3(	CO Company	
Custody Seals Intact: Custody Seal No.: A Yes A No					Cooler Te	mperature(s) °(	Cooler Temperature(s) °C and Other Remarks:	S		-	
					14	12 13	10 11	8 9	6 7	Ver: 11/01/2020	1

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Eurofins TestAmerica Canton Sample Receipt Form/Narrative Canton Facility	Login # :
Client Site Name	Cooler unpacked by:
Cooler Received on <u>5-12-21</u> Opened on <u>5-12-21</u>	Matts
FedEx: 1 <sup>st</sup> Grd Exp UPS FAS Clipper, Client Drop Off TestAmerica Courier	
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 For         IR GUN# IR-11 (CF +0.1 °C)       Observed Cooler Temp. ○ S °C Corrected Cooler Temp.	m Temn (- °C
IR GUN #IR-11 (CF +0.1°C) Observed Cooler Temp°C Corrected Cooler	Temp. °C
	No
	No NA Tests that are not
	NO         checked for pH by           NO         Receiving:
	No NA
	No VOAs Dil and Grease
	TOC
	No No
	> No
e e e e e e e e e e e e e e e e e e e	No c
9. For each sample, does the COC specify preservatives (YN), # of containers (YN), and sa	
10. Were correct bottle(s) used for the test(s) indicated?	No Vo
	) No
•	ND
If yes, Questions 13-17 have been checked at the originating laboratory. 13. Were all preserved sample(s) at the correct pH upon receipt?	) No NA pH Strip Lot# HC022887
	No INA pristipicor <u>neozzoor</u>
	No (NA
17. Was a LL Hg or Me Hg trip blank present? Yes	ŇÒ
Contacted PM Date by via Verbal V	oice 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 holdi	ng time had expired.
Sample(s) were received	
Sample(s) were received with bubble >6 mm in	
20. SAMPLE PRESERVATION	
Sample(s)	ther preserved in the laboratory.
I ime preserved:Preservative(s) added/Lot number(s):	
VOA Sample Preservation - Date/Time VOAs Frozen:	

## Login Container Summary Report

Temperature r	eadings:
---------------	----------

			<u>Cont</u>	ainer	Preservative	
Client Sample ID	<u>Lab ID</u>	Container Type	<u>pH</u>	<u>Temp</u>	Added (mls) Lot #	
MW-15002	240-149188-A-1	Plastic 1 liter - Nitric Acid	<2			
MW-15002	240-149188-B-1	Plastic 1 liter - Nitric Acid	<2			5
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			8
MW-15019	240-149188-A-4	Plastic 1 liter - Nitric Acid	<2			Q
MW-15019	240-149188-В-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			12

Eurofins TestAmerica, Canton											
4101 Shuffel Street NW	0	hain c	of Cus	Chain of Custody Record	ecorc	_				🐝 euronns	Environment Testing
North Canton, OH 44720 Phone: 330-497-9396 Fax: 330-497-0772											America
Client Information (Sub Contract Lab)	Sampler:			Lab PM: Brooks	Lab PM: Brooks, Kris M			Carrier Tracking No(s)	No(s)	COC No: 240-136575.	
Client Contact: Shipping/Receiving	Phone:			E-Mail Kris.E	E-Mait: Kris.Brooks@Eurofinset.com	urofinset	.com	State of Origin: Michigan		Page: Page 1 of 1	
Company. TestAmerica Laboratories, Inc.					Accreditations Required (See note):	ns Required	l (See note):			Job #: 240-149188-1	
Address 13715 Rider Trail North,	Due Date Requested: 6/13/2021	÷					Analvsis Requested	tequested		Preservation Codes	8
city. Earth City	TAT Requested (days):	(s):								A - HCL B - NaOH C - Zn Acetate	M - Hexane N - None O - AsNaO2
State: Zip: MO, 63045	1				200					D - Nitric Acid E - NaHSO4	
Phone 314-298-8566(Tel) 314-298-8757(Fax)	PO#;					ţs				F - MeOH G - Amchlor H - Ascorbic Ac	R - Na2S203 S - H2SO4 d T - TSP Dodecabvdrate
Emait	:# OM				(0)	iJ jegi					
Project Name. Karn/Weadock CCR Groundwater Monitoring	Project #: 24024154				10 SE	eT bret				K - EDTA L - EDA	W - pH 4-5 Z - other (specify)
Sile:	SSOW#:				v) as	onet2 0				of con	
		Sample	Sample Type (C=comp,		ield Filtered MSM mSM 33.0/PrecSep_	qe25919\0. <b>4(</b>				1900 Number	
			Preserve	Preservation Code:	٩X	6					Special Instructions/Note:
MW-15002 (240-149188-1)	5/3/21	14:00 Factern		Water	×	×				2 TVA protocol -	TVA protocol - Ra-226+228 action limit at
MW-15008 (240-149188-2)	5/3/21	15:56 Fastern		Water	×	×				2 TVA protocol -	TVA protocol - Ra-226+228 action limit at 5.0 oCi/l
MW-15016 (240-149188-3)	5/3/21	15:09 Eastern		Water	×	×				2 TVA protocol - 5.0 pCi/L.	TVA protocol - Ra-226+228 action limit at 5.0 pCi/L.
MW-15019 (240-149188-4)	5/3/21	16:03 Eastern		Water	×	×				2 TVA protocol - 5.0 pCi/L.	TVA protocol - Ra-226+228 action limit at 5.0 pCi/L.
DUP-BACKGROUND (240-149188-5)	5/3/21	Eastern		Water	×	×				2 TVA protocol - 5.0 pCi/L.	TVA protocol - Ra-226+228 action limit at 5.0 pCi/L.
FB-BACKGROUND (240-149188-6)	5/3/21	16:03 Eastern		Water	×	×				2 TVA protocol - 5.0 pCi/L.	TVA protocol - Ra-226+228 action limit at 5.0 pCi/L.
										で行め	
Note: Since laboratory accreditations are subject to change. Eurofins TestAmerica places the ownership of method, analyte & accreditation compliance upon out 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/tests/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 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 complicance to Eurofins TestAmerica.	a places the ownership being analyzed, the sa date, return the signed	of method, ar mples must be Chain of Cust	alyte & accrec shipped back ody attesting to	litation complian to the Eurofins ' said complican	ce upon out TestAmerica ce to Eurofir	subcontrac laboratory is TestAme	t laboratories. This s or other instructions v rica.	ample shipment is for vill be provided. Any o	warded under chai changes to accred	n-of-custody. If the la itation status should t	boratory does not currently e brought to Eurofins
Possible Hazard Identification					Sampl	e Dispos	al ( A fee may b	e assessed if sa	mples are ret	Sample Disposal ( A fee may be assessed if samples are retained longer than 1 month)	n 1 month)
Unconfirmed					]	Return To Client	Client	<sup>_</sup> Disposal By Lab	כ	Archive For	Months
Deliverable Requested: I, II, III, IV, Other (specify)	Primary Deliverable	ble Rank: 2			Specia	l Instructi	Special Instructions/QC Requirements	nents:			
linquished by:		Date:			Time:			Method of Shipment:	Shipment:		
and linked	Date/Time: S-12-2	1	0021	Company	Rec	Received by:	FED EX		Date/Time:		Company
Relinquished by: FED EX	Date/Time:			Company	Rec	Received by:	0 1		Date/Time 5113	obuss	Company ETA ST
	Date/Time:			Company	<u>*</u>	Received by:	>		Date/Time:		
Custody Seals Intact: Custody Seal No.:		-			ŏ	ler Temper	Cooler Temperature(s) °C and Other Remarks.	Remarks:			

Ver: 11/01/2020

### Login Sample Receipt Checklist

Client: TRC Environmental Corporation.

### Login Number: 149188 List Number: 2

Job Number: 240-149188	3-1
------------------------	-----

List Source: Eurofins TestAmerica, St. Louis

Creator: Worthington, Sierra M			
Question	Answer	Comment	
Radioactivity wasn't checked or is = background as measured by a survey meter.</td <td>True</td> <td></td> <td></td>	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		1
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		

# 🔅 eurofins

## Environment Testing America

## **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

Brooks

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

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

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.

results through TOTOLACCESS Have a Question? Ask The Expert

LINKS

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## **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

3

### Qualifiers

Rad

Qualifier	Qualifier Description	
U	Result is less than the sample detection limit.	
Glossary		5
Abbreviation	These commonly used abbreviations may or may not be present in this report.	
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis	
%R	Percent Recovery	
CFL	Contains Free Liquid	
CFU	Colony Forming Unit	0
CNF	Contains No Free Liquid	0
DER	Duplicate Error Ratio (normalized absolute difference)	
Dil Fac	Dilution Factor	9
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)	13
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)	

#### 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 160-510305/2-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

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

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

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
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

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

Job ID: 240-149197-1

Client Sample ID: Date Collected: 05/03 Date Received: 05/12	3/21 13:08	В						Lab Sample	ID: 240-149 Matrix:	
Method: 903.0 - Rad	dium-226	(GFPC)								
			Count	Total						
			Uncert.	Uncert.						
Analyte	Result	Qualifier	(2 <b>σ</b> +/-)	(2σ+/-)	RL	MDC		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	%Viold	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	78.1	Quanner	40 - 110					05/18/21 13:46	06/15/21 07:08	1
			Count Uncert.	Total Uncert.						
Analyte		Qualifier	(2σ+/-)	<u>(2σ+/-)</u>		MDC		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
		0						Prepared	Analyzed	Dil Fac
Carrier	%Yield	Qualifier	Limits							
Carrier Ba Carrier	% <b>Yield</b> 78.1	Qualifier	40 - 110					05/18/21 14:33	06/11/21 14:17	1
		Quaimer							06/11/21 14:17 06/11/21 14:17	1
Ba Carrier	78.1 86.0	<u> </u>	40 - 110 40 - 110	nd Radium Total Uncert.	-228					•
Ba Carrier Y Carrier	78.1 86.0 1228 - Com	<u> </u>	40 - 110 40 - 110 dium-226 a Count	Total	1-228 RL	MDC	Unit			•

226 + 228

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

Job ID: 240-149197-1

lient Sample ID: ate Collected: 05/03 ate Received: 05/12	3/21 14:10	0						Lab Sample I		: Water
Method: 903.0 - Rad	dium-226	(GFPC)								
			Count	Total						
			Uncert.	Uncert.						
Analyte		Qualifier	(2σ+/-)	(2σ+/-)	RL	MDC		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	·	1
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		05/18/21 14:33	06/11/21 14:17	1
		-				-	r - ·			
Carrier	%Yield 86.8	Qualifier	Limits 40 - 110					<b>Prepared</b> 05/18/21 14:33	Analyzed 06/11/21 14:17	Dil Fac
Ba Carrier Y Carrier										1
VCarrier	89.7		40 - 110					05/18/21 14:33	06/11/21 14:17	1
Method: Ra226_Ra	228 - Con	າbined Rac	dium-226 a	nd Radium	1-220					
-	228 - Con	nbined Rau	dium-226 al Count	and Radium Total	1-220					
 Method: Ra226_Ra			Count Uncert.	Total Uncert.						
-		Qualifier	Count	Total	<b>RL</b> 5.00	<b>MDC</b>		Prepared	Analyzed 06/15/21 21:24	Dil Fac

226 + 228

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

			Clier	nt Samp	le Res	ults				
lient: TRC Enviro Project/Site: Karn/∖			tom Ash Po	nd					Job ID: 240-14	9197-1
lient Sample			;					Lab Sample		)197-3 : Water
ate Received: 05										
Method: 903.0 - I	Radium-226	(GFPC)	_							
			Count Uncert.	Total Uncert.						
Analyte	Result	Qualifier	(2σ+/-)	(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 - I	Radium-228	(GFPC)								
		(/	Count	Total						
			Uncert.	Uncert.						
Analyte	Result	Qualifier	(2σ+/-)	(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
		Qualifier	Limits 40 - 110					<b>Prepared</b> 05/18/21 14:33		Dil Fac

			Uncert.	Uncert.					
Analyte	Result	Qualifier	(2 <b>σ+/-</b> )	(2σ+/-)	RL	MDC U	Init Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.722		0.326	0.330	5.00	0.459 pC	Ci/L	06/15/21 21:24	1

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

			Clier	nt Samp	le Res	Jults					
lient: TRC Environm	ental Corr	poration.		-				r	Job ID: 240-14	49197-1	
roject/Site: Karn/Wea			.tom Ash Pc	ond						<b>u</b> .e.	
lient Sample ID:	: DEK-M	W-1500€	<u>ن</u>					Lab Sample	ID: 240-149	<del>)</del> 197-4	
ate Collected: 05/03		-						-		: Water	
ate Received: 05/12	2/21 08:00	<u>/</u>									
Method: 903.0 - Rac	dium-226	(GFPC)									,
		•	Count	Total							
			Uncert.	Uncert.							-
Analyte	Result	Qualifier	(2σ+/-)	(2 <b>σ+/-</b> )	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	
<b>^</b>	%/ Viold	Outlifier	l imito					Drepared	Archizod		
Carrier Ba Carrier	80.8	Qualifier	40 - 110					<b>Prepared</b> 05/18/21 13:46	Analyzed 06/15/21 07:08	Dil Fac	
	00.0		40 - 110					00/10/21 10.40	00/10/21 01.00	ı	
Method: 904.0 - Rac	dium-228	(GFPC)									
		· ·	Count	Total							
			Uncert.	Uncert.							
Analyte	Result	Qualifier	(2σ+/-)	(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		Qualifier	Limits					Prepared	Analyzed	Dil Fac	
Ba Carrier	80.8		40 - 110					05/18/21 14:33			
Y Carrier	87.1		40 - 110					05/18/21 14:33	06/11/21 14:18	1	
The threads Decode Dec	202 0.0	No. of De	"		000						
Method: Ra226_Ra2	228 - Com	ibined kad			-228						
			Count	Total							
Analuta	Popult	Qualifier	Uncert.	Uncert.	RL	MDC	Unit	Prepared	Analyzod	Dil Fac	
Analyte			<u>(2σ+/-)</u>	<u>(2σ+/-)</u>				Prepareu	Analyzed		
Combined Radium	1.16		0.369	0.378	5.00	0.464	pCi/L		06/15/21 21:24	1	

226 + 228

Total

Count

Client Sample ID: DUP-DEK-BAP

Method: 903.0 - Radium-226 (GFPC)

Date Collected: 05/03/21 00:00

Date Received: 05/12/21 08:00

2 Lab Sample ID: 240-149197-5 Matrix: Water 4 5

Uncert. Uncert. Dil Fac Analyte **Result Qualifier** (2<del>0</del>+/-) (2**σ**+/-) RL MDC Unit Prepared Analyzed 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 40 - 110 05/18/21 13:46 06/15/21 07:08 Ba Carrier 87.7 1 Method: 904.0 - Radium-228 (GFPC) Count Total Uncert. Uncert. **Result Qualifier** Analyte (2**σ**+/-) (2**σ**+/-) RL MDC Unit Prepared Analyzed Dil Fac 0.295 0.298 0.450 pCi/L 05/18/21 14:33 06/11/21 14:18 Radium-228 0.479 1.00 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 87.9 40 - 110 05/18/21 14:33 06/11/21 14:18 Y Carrier 1 Method: Ra226 Ra228 - Combined Radium-226 and Radium-228 Count Total Uncert Uncert

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

## **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

			Percent Yield (Acceptance Limits)	
		Ва		
Lab Sample ID	Client Sample ID	(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		
<b>T</b>				
Tracer/Carrier Legend	3			

Ba = Ba Carrier

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

#### Matrix: Water

				Percent Yield (Acceptance Limits)
		Ва	Y	
Lab Sample ID	Client Sample ID	(40-110)	(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

Prep Type: Total/NA

## Prep Type: Total/NA

## **QC Sample Results**

Job ID: 240-149197-1

### Method: 903.0 - Radium-226 (GFPC)

Matrix: Water	MB 160-510	304/22-A						Client Sam	ole ID: Metho Prep Type:	
Analysis Batch:	514296								Prep Batch	
			Count	Total						
	м	В МВ	Uncert.	Uncert.						
Analyte	Resu	t Qualifier	(2 <b>σ+/-</b> )	(2 <b>σ+/-</b> )	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.120	D U	0.103	0.104	1.00	0.156	pCi/L	05/18/21 13:46	06/15/21 07:09	9 1
		B MB								
Carrier		d Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	86.	8	40 - 110					05/18/21 13:46	06/15/21 07:0	9 1
Lab Sample ID:	LCS 160-51	0304/1-A					Cli	ent Sample ID:		
Matrix: Water									Prep Type:	
Analysis Batch:	: 514248				Total				Prep Batch	: 510304
		Spike	LCS	LCS	Uncert.				%Rec.	
Analyte		Added	Result	Qual	(2 <b>σ</b> +/-)	RL	MDC	Unit %Rec	Limits	
Radium-226		11.3	10.88		1.21	1.00	0.208	pCi/L 96	75 - 125	
	LCS LCS									
Carrier %	%Yield Qualifi	er Limits								
De Cermier		40 - 110	-							
Ba Carrier	82.0	40 - 110								
							Client S	ampio ID: Lab	Control San	
Lab Sample ID:							Client S	ample ID: Lab		
Lab Sample ID: Matrix: Water	LCSD 160-{						Client S	ample ID: Lab	Prep Type:	Total/NA
Lab Sample ID: Matrix: Water	LCSD 160-{				Total		Client S	ample ID: Lab		Total/NA
Lab Sample ID: Matrix: Water	LCSD 160-{	510304/2-A	LCSD	LCSD	Total Uncert.		Client S	ample ID: Lab	Prep Type:	Total/NA : 510304
Lab Sample ID: Matrix: Water Analysis Batch:	LCSD 160-{		LCSD Result		Uncert.	RL	Client S		Prep Type: Prep Batch %Rec.	Total/NA : 510304 RER
Lab Sample ID: Matrix: Water Analysis Batch: Analyte	LCSD 160-{	510304/2-A Spike						Unit %Rec	Prep Type: Prep Batch %Rec. Limits R	Total/NA : 510304 RER
Lab Sample ID: Matrix: Water Analysis Batch: Analyte Radium-226	LCSD 160-{	510304/2-A Spike Added	Result		Uncert. (2σ+/-)	RL	MDC	Unit %Rec	Prep Type: Prep Batch %Rec. Limits R	Total/NA : 510304 RER ER Limit
	LCSD 160-{ : 514248 	510304/2-A Spike Added 11.3	Result		Uncert. (2σ+/-)	RL	MDC	Unit %Rec	Prep Type: Prep Batch %Rec. Limits R	Total/NA : 510304 RER ER Limit
Lab Sample ID: Matrix: Water Analysis Batch: Analyte Radium-226	LCSD 160-{ : 514248	510304/2-A Spike Added 11.3	Result		Uncert. (2σ+/-)	RL	MDC	Unit %Rec	Prep Type: Prep Batch %Rec. Limits R	Total/NA : 510304 RER ER Limit
Lab Sample ID: Matrix: Water Analysis Batch: Analyte Radium-226 Carrier % Ba Carrier	LCSD 160-5 514248 LCSD LCSD 6Yield Qualific 87.1	510304/2-A Spike Added 11.3 er Limits 40 - 110	Result 11.52		Uncert. (2σ+/-)	RL	MDC	Unit %Rec	Prep Type: Prep Batch %Rec. Limits R	Total/NA : 510304 REF ER Limi
Lab Sample ID: Matrix: Water Analysis Batch: Analyte Radium-226 Carrier % Ba Carrier	LCSD 160-5 514248 LCSD LCSD 6Yield Qualific 87.1	510304/2-A Spike Added 11.3 er Limits 40 - 110	Result 11.52		Uncert. (2σ+/-)	RL	MDC	Unit %Rec	Prep Type: Prep Batch %Rec. Limits R	Total/NA : 510304 RER ER Limit
Lab Sample ID: Matrix: Water Analysis Batch: Analyte Radium-226 Carrier Ba Carrier Iethod: 904.0 Lab Sample ID:	LCSD 160- 514248 LCSD LCSD 6Yield Qualifit 87.1 - Radium	510304/2-A Spike Added 11.3 er Limits 40 - 110 -228 (GFPC	Result 11.52		Uncert. (2σ+/-)	RL	MDC	Unit %Rec pCi/L 102	Prep Type: Prep Batch %Rec. Limits RI 75-125 0.	Total/NA : 510304 RER 26 Limit 1 00 Blank
Lab Sample ID: Matrix: Water Analysis Batch: Analyte Radium-226 Carrier Ba Carrier Iethod: 904.0 Lab Sample ID: Matrix: Water	LCSD 160- 514248 LCSD LCSD 6Yield Qualifit 87.1 - Radium MB 160-510	510304/2-A Spike Added 11.3 er Limits 40 - 110 -228 (GFPC	Result 11.52		Uncert. (2σ+/-)	RL	MDC	Unit %Rec pCi/L 102	Prep Type: Prep Batch %Rec. Limits RI 75-125 0.	Total/NA : 510304 RER Limit 26 1 1 500 Blank Total/NA
Lab Sample ID: Matrix: Water Analysis Batch: Analyte Radium-226 Carrier Ba Carrier Method: 904.0 Lab Sample ID: Matrix: Water	LCSD 160- 514248 LCSD LCSD 6Yield Qualifit 87.1 - Radium MB 160-510	510304/2-A Spike Added 11.3 er Limits 40 - 110 -228 (GFPC	Result 11.52	Qual	Uncert. (2σ+/-)	RL	MDC	Unit %Rec pCi/L 102	Prep Type: Prep Batch %Rec. Limits RI 75-125 0.	Total/NA : 510304 RER Limit 26 1 1 500 Blank Total/NA
Lab Sample ID: Matrix: Water Analysis Batch: Analyte Radium-226 Carrier Ba Carrier Method: 904.0 Lab Sample ID: Matrix: Water	LCSD 160- 514248 LCSD LCSD 6Yield Qualifit 87.1 - Radium MB 160-510 513770	510304/2-A Spike Added 11.3 er Limits 40 - 110 -228 (GFPC 0305/22-A	Result 11.52	Qual	Uncert. (2σ+/-)	RL	MDC	Unit %Rec pCi/L 102	Prep Type: Prep Batch %Rec. Limits RI 75-125 0.	Total/NA : 510304 RER Limit 26 1 1 od Blank Total/NA
Lab Sample ID: Matrix: Water Analysis Batch: Analyte Radium-226	LCSD 160-5 514248 LCSD LCSD 6Yield Qualifie 87.1 - Radium MB 160-510 513770	510304/2-A Spike Added 11.3 er Limits 40 - 110 -228 (GFPC	Result 11.52	Qual	Uncert. (2σ+/-)	RL	<b>MDC</b> 0.163	Unit %Rec pCi/L 102	Prep Type: Prep Batch %Rec. Limits RI 75-125 0.	Total/NA : 510304 RER Limit 26 1 1 od Blank Total/NA

	MB	МВ				
Carrier	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
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

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

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

Lab Sample Matrix: Wat	ter		5/1-A					Clie	ent Sai	mple ID:	Lab Cont Prep Typ	e: Tot	al/NA		
Analysis Ba	atch: 5139	48				Total					Ргер Ва	icn: 51	10305		
			Spike	LCS	LCS	Uncert.					%Rec.				
Analyte			Added	Result	Qual	(2σ+/-)	RL	MDC	Unit	%Rec	Limits				
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	e ID: LCSI	0 160-5103	05/2-A					Client S	ample	ID: Lab	Control S	ample	e Dup		
Matrix: Wat									1.1		Prep Typ				
Analysis Ba	atch: 5139	48									Prep Bat				
-						Total									
			Spike	LCSD	LCSD	Uncert.					%Rec.		RER		
Analyte			Added	Result	Qual	(2σ+/-)	RL	MDC	Unit	%Rec	Limits	RER	Limit		
Radium-228			9.64	9.100		1.10	1.00	0.397	pCi/L	94	75 - 125	0.18	1		
	LCSD	LCSD													
	2002												e Dup tal/NA 10305 e Dup tal/NA 10305 RER Limit		
Carrier		Qualifier	Limits												
<b>Carrier</b> Ba Carrier		Qualifier	Limits 40 - 110												

## **QC Association Summary**

Client: TRC Environmental Corporation. Project/Site: Karn/Weadock CCR DEK Bottom Ash Pond Job ID: 240-149197-1

#### 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	

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

#### Client Sample ID: DEK-MW-15002 Date Collected: 05/03/21 13:08 Date Received: 05/12/21 08:00

Date Received: 05/12/21 08:00												
_	Batch	Batch		Dilution	Batch	Prepared						
Prep Type	Туре	Method	Run	Factor	Number	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				

1

1

513770 06/11/21 14:17 SCB

514477 06/15/21 21:24 GRW

#### Client Sample ID: DEK-MW-15004 Date Collected: 05/03/21 14:10 Date Received: 05/12/21 08:00

Analysis

Analysis

904.0

Ra226 Ra228

Total/NA

Total/NA

-	Batch	Batch		Dilution	Batch	Prepared		
Prep Type	Туре	Method	Run	Factor	Number	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 Date Collected: 05/03/21 11:35 Date Received: 05/12/21 08:00

	Batch	Batch		Dilution	Batch	Prepared		
Prep Type	Туре	Method	Run	Factor	Number	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 Date Collected: 05/03/21 10:25 Date Received: 05/12/21 08:00

	Batch	Batch		Dilution	Batch	Prepared		
Prep Type	Туре	Method	Run	Factor	Number	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

6/17/2021

Job ID: 240-149197-1

**Matrix: Water** 

**Matrix: Water** 

Lab Sample ID: 240-149197-1

TAL SL

TAL SL

Lab Sample ID: 240-149197-2

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

## Lab Sample ID: 240-149197-3

Lab Sample ID: 240-149197-4

Matrix: Water

**Matrix: Water** 

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

#### Client Sample ID: DUP-DEK-BAP Date Collected: 05/03/21 00:00 Date Received: 05/12/21 08:00

_	Batch	Batch		Dilution	Batch	Prepared		
Prep Type	Туре	Method	Run	Factor	Number	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

#### Laboratory References:

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

Job ID: 240-149197-1

Matrix: Water

Lab Sample ID: 240-149197-5

## Accreditation/Certification Summary

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

#### Job ID: 240-149197-1

Eurofins	TestAmerica,	Canton
Luionno	resu anonou,	ounton

Laboratory: Eurofins	TestAmerica, St. Louis
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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
lowa	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

Eurofins TestAmerica, Canton 4101 Shuftel Street NW North Canton. OH 4720	ひ, 8/ ひら Chain of Custody Record	J.g.	of Cust	tody R	ecord	MIC	MICHIGAN 190		🔅 eurofins Environ	Environment Testing America
Phone: 330-497-9396 Fax: 330-497-0772										
Client Information	Sampler: J. Kr	25		Brool	Lab PM: Brooks, Kris M		Carrier Tracking No(s):		COC No: 240-82582-29052.1	
Client Contact Jacob Krenz	Phone: 734-395	1	4020	E-Mail Kris.F	E-Mailt: Kris.Brooks@Eurofinset.com	et.com	State of Origin:		Page: Page 1 of 1	
Company: TRC Environmental Corporation.			PWSID:			Inalysis	Requested		Job #:	
Address 1540 Eisenhower Place	Due Date Requested:	÷								
Ciry: Ann Arbor	TAT Requested (days):	ys):							A - HCL M - Hexal B - NaOH N - None C - Zn Acetate O - AsNa	M - Hexane N - None O - AsNaO2
State, Zp: MI, 48108-7080	Compliance Projec	A Yes	∆ No							03
i) 734-971-9022(Fax)	PO#: TBD				(0					203 4 Merahvdrata
	:# OM				_					he
ottom Ash Pond	Project #: 24024154				bC is ou				K - EDTA W - pH 4. L - EDA Z - other	5 specify)
	SSOW#:				528 <sup>-</sup> CI				Other:	
	Samula Data	Sample	Sample Type (C=comp,	Matrix (w=water, S=solid, O=waste/oll,	ield Filtered erform MS/M 03.0, Ra226Ra 04.0 - Standard			otal Number		
		X		tion Code:					Special Instructions/Note	Is/Note:
DEK-MW-15002	5/3/m	13:08	0	Water	XXNN					
DEK-MW-15004	S/3/W	01:41	-	Water	NN. X X					
DEK-MW-15005	C/3/W	11:35		Water	MV X X					
DEK-MW-15006	5/1/21	11.25		Water	XXXVV					
d be - 739 - + Abrand	12/2/21	1	>	Water	3					
				Water						
						240-149197 Chain of Custody	of Custody			
								-		
Possible Hazard Identification					Sample Disp	osal ( A fee may be	assessed if sample	s are retaine	ger than 1 mo	Τ
dill			radiological		Special Instrue	Special Instructions/QC Requirements	Uisposal By Lab ents:	Archive For	e For Months	S
quished by:		Date:			Time:		Method of Shipment	ent		Τ
Reinquiched by	Date/Time	1153(	ہ 9	Company	Received by	11/1 11/Au	Date/Time:	Time: 12/21	1536 Company	74
Reinfaytsned by Ally Micha - Lold Storage Reinfaustred by	Date/Time	1545		Company ETA Company	Received by	2 Clame	Date/Time	N	1 9:40 Company	121
Custody Seals Intact: Custody Seal No.:					Cooler Temp	Cooler Temperature(s) °C and Other Remarks				
A Yes & No					-				DCDC110111 - seeV	000011
					<b>13</b> 14	11 12	8 9 10	7	3 4 5 6	1

	5
	8
	9
1	3

Eurofins TestAmerica Canton Sample Receipt Form/Narrative Canton Facility	Login # :	149197
Client Jacob Krenz Site Name	Cooler unp	backed by:
Cooler Received on $5/12/2$ Opened on $5/12/2$	Tren	+ C
FedEx: 1 <sup>st</sup> 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		
COOLANT:       Wet Ice       Blue Ice       Dry Ice       Water       None         1.       Cooler temperature upon receipt       ,       □       See Multiple Cooler For         IR GUN# IR-11 (CF +0.1 °C)       Observed Cooler Temp.       .       ?       °C       Corrected Cooler 7	m Femp. 0. 7	°C
IR GUN #IR-12 (CF +0.2°C) Observed Cooler Temp°C Corrected Cooler	Гетр	°C
<ul> <li>-Were tamper/custody seals on the bottle(s) or bottle kits (LLHg/MeHg)?</li> <li>-Were tamper/custody seals intact and uncompromised?</li> <li>Shippers' packing slip attached to the cooler(s)?</li> <li>Did custody papers accompany the sample(s)?</li> <li>Were the custody papers relinquished &amp; signed in the appropriate place?</li> <li>Was/were the person(s) who collected the samples clearly identified on the COC?</li> <li>Did all bottle sarrive in good condition (Unbroken)?</li> <li>Could all bottle labels (ID/Date/Time) be reconciled with the COC?</li> <li>For each sample, does the COC specify preservatives (Y/N), # of containers (Y/N), and sa</li> <li>Were correct bottle(s) used for the test(s) indicated?</li> <li>Sufficient quantity received to perform indicated analyses?</li> <li>Are these work share samples and all listed on the COC?</li> <li>If yes, Questions 13-17 have been checked at the originating laboratory.</li> <li>Were all preserved sample(s) at the correct pH upon receipt?</li> <li>Were VOAs on the COC?</li> <li>Were air bubbles &gt;6 mm in any VOA vials?</li> <li>Larger than this.</li> <li>Was a VOA trip blank present in the cooler(s)? Trip Blank Lot #</li> </ul>	No NA No No No No No No No No No No No No No	Tests that are not checked for pH by Receiving: VOAs Oil and Grease TOC rab/comp(VAV)?
17. Was a LL Hg or Me Hg trip blank present? Yes	No	د
Contacted PM Date by via Verbal V	oice Mail Oth	er
Concerning		
18. CHAIN OF CUSTODY & SAMPLE DISCREPANCIES additional next page	Samples proc	cessed by:
19. SAMPLE CONDITION Sample(s)	ng time had ex	pired.
Sample(s)     were received       Sample(s)     were received with bubble >6 mm in	diameter. (No	otify PM)
20. SAMPLE PRESERVATION		•
Sample(s)	ther preserved	in the laboratory.
Ime preserved:       Preservative(s) added/Lot number(s):         VOA Sample Preservation - Date/Time VOAs Frozen:		

## Login Container Summary Report

190-25902

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

Eurofins TestAmerica, Canton 4101 Shuffel Street NW	U	Chain e	of Cus	ain of Custodv Record	ecord	_				🔅 eurofins	
North Canton、OH 44720 Phone: 330-497-9396 Fax: 330-497-0772											America
Client Information (Sub Contract Lab)	Sampler			Lab PM Brook	Lab PM: Brooks, Kris M			Carrier Tracking No(s)	king No(s).	COC No: 240-136582.1	
Client Contact Shipping/Receiving	Phone:			E-Mail: Kris.B	E-Mail: Kris.Brooks@Eurofinset.com	iurofins	et.com	State of Origin: Michigan	jin:	Page: Page 1 of 1	
Company: TestAmerica Laboratories, Inc.					Accreditatio	ns Requir	Accreditations Required (See note):			Job #: 240-149197-1	
Address 13715 Rider Trail North,	Due Date Requested: 6/13/2021	ż					Analysis	Analysis Requested		Preservation Codes:	8
City: Earth City State Zin:	TAT Requested (d	iys):								A - HCL B - NaOH C - Zn Acetate D - Nitric Acid	m - nexane N - None O - AsNaO2 P - Na2O4S
More 53045 Bhano 63045	*0				,					E - NaHSO4 F - MeOH	
314-298-8566(Tel) 314-298-8757(Fax)	*									G - Amchlor H - Ascorbic Acid	
Email:	# OM				(on						
Project Name: Karn/Weadock CCR Groundwater Monitoring	Project #: 24024154				10 <b>50</b>					K - EDIA L - EDA	W - pH 4-5 Z - other (specify)
Site	SSOW#:				N GS					of cot	
		Sample	Sample Type (C=comp,	Matrix (w=water, S=soltd. O=waste/oll,	beretiit bie M/SM mone 3.0/PrecSep_	J_qe2serq\0.4	1226Ra228_GH			tedmuM liste	
Sample Identification - Client ID (Lab ID)	Sample Date		G=grab) Preserva	Preservation Code:	a X		2				Special Instructions/Note:
DEK-MW-15002 (240-149197-1)	5/3/21	13:08 Eactorn		Water		×	×			2 TVA protocol - R	TVA protocol - Ra-226+228 action limit at
DEK-MW-15004 (240-149197-2)	5/3/21	14:10 Fastern		Water	×	×	×			2 TVA protocol - Ra	TVA protocol - Ra-226+228 action limit at
DEK-MW-15005 (240-149197-3)	5/3/21	11:35 Eastern		Water	×	×	×			2 TVA protocol - Ra 5.0 pCi/L	IVA protocol - Ra-226+228 action limit at 5.0 pCi/L.
DEK-MW-15006 (240-149197-4)	5/3/21	10:25 Eastern		Water	×	×	×			2 TVA protocol - Ra 5.0 pCi/L	TVA protocol - Ra-226+228 action limit at 5.0 pCi/L.
DUP-DEK-BAP (240-149197-5)	5/3/21	Eastern		Water	×	×	×			2 TVA protocol - R	TVA protocol - Ra-226+228 action limit at 5.0 pCi/L.
						_					
						_					
Note: Since laboratory accreditations are subject to change, Eurofins TestAmerica places the ownership of method, analyle & accreditation compliance upon out 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/lestSimatix being analyzed, the samples 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 complicance to Eurofins TestAmerica attention immediately. If all requested accreditations are current to date, return the signed Chain of Custody attesting to said complicance to Eurofins TestAmerica.	tica places the ownershi to being analyzed, the so date, return the signer	p of method, a amples must b	nalyte & accrec s shipped back tody attesting to	ditation complia to the Eurofins o said complica	nce upon out TestAmerica nce to Eurofi	subcontr laborato	act laboratories. Th ry or other instruction merica.	s sample shipment i s will be provided.	<pre>k l l l k forwarded under ch Any changes to accre</pre>	ain-of-custody. If the labo ditation status should be t	ratory does not currently prought to Eurofins
Possible Hazard Identification					Samp	e Disp	osal ( A fee ma)	/ be assessed i	f samples are re	Sample Disposal ( A fee may be assessed if samples are retained longer than 1 month)	1 month)
Unconfirmed Deliverable Requested: I, II, III, IV, Other (specify)	Primary Deliverable	able Rank: 2			Specia	Return I Instru	Return To Client Dispecial Instructions/QC Requirements:	<i>Disposal By Lab</i> rements:	/ Lab	Archive For	Months
Empty Kit Relinquished by:		Date:			Time:			Metho	Method of Shipment:		
1	Date/Time: 5-12.2		715	Company	Rec	Received by:	FED EX		Date/Time:		Company
Relinquished by: FED'EX'	Date/Time:			Company	Rec	Received by	1 Mar	V	Date/Time: 5/13/D	2480	Company E 7 4 STC
Relinquished by:	Date/Time:			Company	Rec	Received by	)		Date/Time:		Company
Custody Seals Intact: Custody Seal No.:					<u>ð</u>	oler Temp	Cooler Temperature(s) °C and Other Remarks:	ther Remarks:			
											Ver: 11/01/2020

5

### Login Sample Receipt Checklist

Client: TRC Environmental Corporation.

#### Login Number: 149197 List Number: 2 ator: Worthington Siorra M

Creator: Worthington, Sierra M		
Question	Answer	Comment
Radioactivity wasn't checked or is = background as measured by a survey meter.</td <td>True</td> <td></td>	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	

# 🔅 eurofins

## Environment Testing America

## **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

Brooks

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

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

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The

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Expert

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

3

### Qualifiers

Rad

Rad		
Qualifier	Qualifier Description	4
U	Result is less than the sample detection limit.	
Glossary		5
Abbreviation	These commonly used abbreviations may or may not be present in this report.	6
¤	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	0
CNF	Contains No Free Liquid	0
DER	Duplicate Error Ratio (normalized absolute difference)	
Dil Fac	Dilution Factor	9
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	

#### 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 160-510305/2-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

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

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

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		4
240-149195-2	DEK-MW-18001	Water	05/03/21 11:28	05/12/21 08:00		
						5
						6
						8
						9

Eurofins TestAmerica, Canton

### **Client Sample Results**

## Lab Sample ID: 240-149195-1 **Matrix: Water**

Date Collected: 05/03/21 12:33 Date Received: 05/12/21 08:00

Client Sample ID: DEK-MW-15003

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analvzed	Dil Fac
			<u> </u>	<u> </u>						Dirrac
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	Analvzed	Dil Fac	
Radium-228	-0.0302		0.305	0.305	1.00	0.548		05/18/21 14:33		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

			Count	Total							
			Uncert.	Uncert.							
Analyte	Result	Qualifier	(2σ+/-)	(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	

5

## **Client Sample Results**

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

			Clier	nt Samp	le Res	Jults					
lient: TRC Environm	nental Corr	ooration.		-				,	Job ID: 240-14	49195-1	
roject/Site: Karn/We			.tom Ash Pc	ond				-		0100	
Client Sample ID	: DEK-M	W-18001	í					Lab Sample	ID: 240-149	<del>)</del> 195-2	
ate Collected: 05/0		-							Matrix	: Water	
Date Received: 05/12	2/21 08:00	<u>I</u>									
Method: 903.0 - Rad	dium-226	(GFPC)									
		•	Count	Total							
			Uncert.	Uncert.							
Analyte	Result	Qualifier	(2σ+/-)	(2 <b>σ+/-</b> )	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	
	A ( \ P = 1 - 1							-			
Carrier		Qualifier	Limits					Prepared	Analyzed	Dil Fac	ľ
Ba Carrier	90.1		40 - 110					05/18/21 13:46	06/15/21 07:08	1	
- Method: 904.0 - Rad	dium-228	(GFPC)									
			Count	Total							
			Uncert.	Uncert.							
Analyte	Result	Qualifier	(2σ+/-)	(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		Qualifier	Limits					Prepared	Analyzed	Dil Fac	
Ba Carrier	90.1		40 - 110					05/18/21 14:33			
Y Carrier	69.9		40 - 110					05/18/21 14:33	06/11/21 14:17	1	
Method: Ra226_Ra	1228 - Com	ibined Rac			<b>-228</b>						
			Count	Total							
	_		Uncert.	Uncert.							
Analyte		Qualifier	(2σ+/-)	(2σ+/-)	RL	MDC		Prepared	Analyzed	Dil Fac	
Combined Radium	0.828		0.406	0.411	5.00	0.596	pCi/L		06/15/21 21:24	1	

226 + 228

Eurofins TestAmerica, Canton

## **Tracer/Carrier Summary**

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

Prep Type: Total/NA

## Method: 903.0 - Radium-226 (GFPC)

#### Matrix: Water

				Percent Yield (Acceptance Limits)	
		Ва			
Lab Sample ID	Client Sample ID	(40-110)			5
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			
LCSD 160-510304/2-A	Lab Control Sample Dup	87.1			
MB 160-510304/22-A	Method Blank	86.8			
Tracer/Carrier Legend	d				8
Ba = Ba Carrier					Q
Method: 904.0 - R	adium-228 (GFPC)				
Matrix: Water				Prep Type: Total/NA	
				Percent Yield (Acceptance Limits)	
		Ва	Y		
Lab Sample ID	Client Sample ID	(40-110)	(40-110)		
240-149195-1	DEK-MW-15003	79.3	90.1		

				Percent Yield (Acceptance Limits)	
		Ва	Y		
Lab Sample ID	Client Sample ID	(40-110)	(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		13
LCSD 160-510305/2-A	Lab Control Sample Dup	87.1	90.5		
MB 160-510305/22-A	Method Blank	86.8	84.9		
Tracor/Carrier Logono	4				

#### Tracer/Carrier Legend

Ba = Ba Carrier

Y = Y Carrier

## **QC Sample Results**

Job ID: 240-149195-1

## Method: 903.0 - Radium-226 (GFPC)

Lab Sample		60-5103	04/22-A						Clie	ent Samp	ole ID: Me		
Matrix: Water											Prep Typ		
Analysis Bat	cn: 5142	96		Count	Total						Prep Bat	cn: 5	10304
		мв	MR	Uncert.	Uncert.								
Analyte			Qualifier	(2σ+/-)	(2σ+/-)	RL	MDC	Unit	Р	repared	Analyze	d	Dil Fac
Radium-226		0.1200		0.103	0.104	1.00	0.156			8/21 13:46			1
			-	0.100	0.104	1.00	0.100	poi/L	00/1	0/21 10.40	00/10/210	1.00	
Carrier			MB Qualifier	Limits					D	repared	Analyze	d	Dil Fac
Ba Carrier		86.8		40 - 110							06/15/21 0	·	1
Lab Sample   Matrix: Wate		160-510	304/1-A					Cli	ent Sai	nple ID:	Lab Cont Prep Typ		
Analysis Bat		48									Prep Bat		
	011. 0142					Total						511. 5	10004
			Spike	LCS	LCS	Uncert.					%Rec.		
Analyte			Added	Result	Qual	(2 <b>σ+/-</b> )	RL	MDC	Unit	%Rec	Limits		
Radium-226			11.3	10.88		1.21	1.00	0.208	pCi/L	96	75 - 125		
	LCS	LCS											
Carrier		Qualifier	Limits										
Ba Carrier	82.0		40 - 110	-									
													_
Lab Sample		J 160-51	0304/2-A					Client S	sample	ID: Lab	Control S		
Matrix: Water Analysis Bat		18									Prep Typ Prep Bat		
Analysis Dat	CII. 3142	0				Total					пер Ба	UII. U	10004
			Spike	LCSD	LCSD	Uncert.					%Rec.		RER
Analyte			Added	Result	Qual	(2σ+/-)	RL	MDC	Unit	%Rec	Limits	RER	Limit
Radium-226			11.3	11.52		1.25	1.00	0.163		102	75 - 125	0.26	1
	1050	LCSD											
Carrier		Qualifier	Limits										
Ba Carrier	87.1		40 - 110	-									
lethod: 904	I.0 - Ra	dium-2	228 (GFPC	<b>;</b> )									
Lab Sample I	D: MB 1	60-5103	05/22-A						Clie	ent Same	ole ID: Me	thod	Blank
Matrix: Water											Prep Typ		
Analysis Bat		70									Prep Bat		
-				Count	Total						-		
		MB	MB	Uncert.	Uncert.								
Analyte			MB Qualifier	Uncert. (2σ+/-)	Uncert. (2σ+/-)	RL	MDC	Unit	Р	repared	Analyze	d	Dil Fac

	0.1102	0	0.200	0.200	1.00	0.100 powe	00/10/21 11:00	00/11/21 11.10	
	MB	МВ							
Carrier	%Yield	Qualifier	Limits				Prepared	Analyzed	Dil Fac
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

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

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

Analyte Radium-228SpikeLCSLCSUncert. QualMDCUnit pCi/L9LCSLCS $CS$ <t< th=""><th>%Rec Rec Limits 99 75-12</th><th>i</th><th></th></t<>	%Rec Rec Limits 99 75-12	i	
AnalyteAddedResultQual(2σ+/-)RLMDCUnit%Radium-2289.649.4961.161.000.469pCi/L%LCSLCSLCSLCSBa Carrier% YieldQualifierLimitsBa Carrier82.040 - 11040 - 110KoloneKoloneKoloneY Carrier89.340 - 110KoloneKoloneKoloneKoloneLab Sample ID: LCSD 160-510305/2-AClient Sample ID:Client Sample ID:Kolone	Rec Limits	i	
Radium-228         9.64         9.496         1.16         1.00         0.469         pCi/L           LCS         LCS         LCS         Ba         Ba         Carrier         % Yield         Qualifier         Limits         40 - 110         Carrier         89.3         40 - 110         Client Sample ID:         Client Sample ID: <t< th=""><th>99 75-12</th><th></th><th></th></t<>	99 75-12		
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       Client Sample ID:		.5	
Carrier% Yield 82.0Qualifier 40 - 110Ba Carrier82.040 - 110Y Carrier89.340 - 110Lab Sample ID: LCSD 160-510305/2-AClient Sample ID:			
Ba Carrier         82.0         40 - 110           Y Carrier         89.3         40 - 110           Lab Sample ID: LCSD 160-510305/2-A         Client Sample ID:			
Y Carrier         89.3         40 - 110           Lab Sample ID: LCSD 160-510305/2-A         Client Sample ID:			
Lab Sample ID: LCSD 160-510305/2-A Client Sample ID:			
		1.0	- D
Watrix: Water			
Analysis Batch: 513948		ype: To Batch: 5	
Total	гіері	Satch. S	10303
Spike LCSD LCSD Uncert.	%Rec		RER
•	Rec Limits		Limit
Radium-228 9.64 9.100 1.10 1.00 0.397 pCi/L	94 75 - 12		1
LCSD LCSD			
Carrier%Yield QualifierLimits			
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		
rep Batch: 510305						
Lab Sample ID	Client Sample ID	Ргер Туре	Matrix	Method	Prep Batch	
Lab Sample ID 240-149195-1	Client Sample ID DEK-MW-15003	Prep Type Total/NA	Matrix Water	Method PrecSep_0	Prep Batch	
·	•				Prep Batch	
240-149195-1	DEK-MW-15003	Total/NA	Water	PrecSep_0	Prep Batch	
240-149195-1 240-149195-2	DEK-MW-15003 DEK-MW-18001	Total/NA Total/NA	Water Water	PrecSep_0 PrecSep_0	Prep Batch	

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

#### Client Sample ID: DEK-MW-15003 Date Collected: 05/03/21 12:33 Date Received: 05/12/21 08:00

		0.00						
_	Batch	Batch		Dilution	Batch	Prepared		
Prep Type	Туре	Method	Run	Factor	Number	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 Date Collected: 05/03/21 11:28 Date Received: 05/12/21 08:00

	Batch	Batch		Dilution	Batch	Prepared		
Prep Type	Туре	Method	Run	Factor	Number	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

Lab Sample ID: 240-149195-1 Matrix: Water

Lab Sample ID: 240-149195-2

Matrix: Water

Job ID: 240-149195-1

## Accreditation/Certification Summary

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

#### Job ID: 240-149195-1

	5
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1	2
	13

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
lowa	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

🐝 eurofins America	COC No: 240-82583-29053.1	Page. Page 1 of 1	Job #		A - HCL M - Hexane B - NaOH N - None C - Zn Acetate O - AsNaO2			I - Ice J - DI Water	K - EDTA L - EDA	Officer:	Cotal Number									tained longer than 1 month) Archive For			al Company	Company Company	Company		- 2 2 4.: 11/01/2020 - 4.: 11/01/2020 - 7
MICHIGAN 190	Carrier Tracking No(s):	State of Origin: DM	Analysis Requested								2	40-1	4915	95 Ct	nain	of Cu	ustod)			ee may be assessed if samples are re	Requirements:	Method of Shipment:	Mr Mr Mr DaterTime: 1	Cleave Date/Time:		Cooler Temperature(s) °C and Other Remarks:	8 9 10 11 12
Chain of Custody Record	Lab PM: Brooks, Kris M	E-Mail: Kris.Brooks@Eurofinset.com					(o		EbC 98 ot	528 <sup>-</sup> GI	ple Matrix (wwwarr) (wwa	ation Code: XXD I	water XN X X	Water XXX X	Water							Time:	1	₹À		Cooler Temperatu	13 14
0.8   0.9  Chain of C	Sampler: Jake Kranc	Phone: 734-345-9804	DISMA	Due Date Requested:	TAT Requested (days):	Compliance Project: 🗠 Yes 📣 No	Po#: TBD	:# OM	Project #: 24024154	SSOW#:	Sample Type Sample (C=comp.	X	S-7-21 1273 6	5-3-21 1128 G						Poison B Duknown Radiological		Date:	Date/Time: S-7-21 /1577		Date/Time:		
Eurofins TestAmerica, Canton 4101 Shuffel Street NW North Canton, OH 44720 Phone: 330-497-9396 Fax: 330-497-0772	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: Karn/Weadock CCR DEK Bottom Ash Pond & I	Site:	Sample Identification		DEK-MW-15003	DEK-MW-18001						ant		Empty Kit Relinquished by:	Reinfluished by:	Refiguerado by Cally Me - cold Storge		Custody Seals Intact: Custody Seal No.: A Yes A No	

Eurofins TestAmerica Canton Sample Receipt Form/Narrative	Login # : 149195
Canton Facility	Cooler unpacked by:
Client Jacob Krenz Site Name Cooler Received on 5/12/21 Opened on 5/12/21	Torend C
Receipt After-hours: Drop-off Date/Time Storage Location	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 For         IR GUN# IR-11 (CF +0.1 °C)       Observed Cooler Temp. ○ ? ° C Corrected Cooler T         IR GUN #IR-12 (CF +0.2°C)       Observed Cooler Temp. ° C Corrected Cooler T	ſemp. <u> </u>
2. Were tamper/custody seals on the outside of the cooler(s)? If Yes Quantity	
-Were the seals on the outside of the cooler(s) signed & dated? -Were tamper/custody seals on the bottle(s) or bottle kits (LLHg/MeHg)? -Were tamper/custody seals intact and uncompromised? Yes	No NA No NA No NA No NA No VOAs
	No Oil and Grease
	No TOC
	No
7. Did all bottles arrive in good condition (Unbroken)?	No
	No
9. For each sample, does the COC specify preservatives (Y/N), # of containers (X/N), and sat	
	No
	No
	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?	No NA pH Strip Lot# HC022887
	No NA pristrip Lot# <u>nC022007</u>
	No NA
16. Was a VOA trip blank present in the cooler(s)? Trip Blank Lot # Yes	
17. Was a LL Hg or Me Hg trip blank present? Yes	
Contacted PM Date by via Verbal Vo	bice Mail Other
Concerning	
Concerning	
18. CHAIN OF CUSTODY & SAMPLE DISCREPANCIES additional next page	Samples processed by:
19. SAMPLE CONDITION	
Sample(s) were received after the recommended holdin	ng 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 furt	her preserved in the laboratory.
Sample(s) were furt Time preserved: Preservative(s) added/Lot number(s):	ner preserved in the hoordtory.
VOA Sample Preservation - Date/Time VOAs Frozen:	

Eurofins TestAmerica, Canton						🗟 eurofins	
4101 Shuffel Street NW North Canton, OH 44720 Phone: 330-497-9396 Fax: 330-497-0772	Chain	Chain of Custody Record	y Record			Environment Testing America	gui
Client Information (Sub Contract Lab)	Sampler:		Lab PM: Brooks, Kris M	Carrier Tracking No(s)		COC No: 240-136581.1	
Client Contact: Shipping/Receiving	Phone:		E-Mait: Kris.Brooks@Eurofinset.com	State of Origin: Michigan		Page: Page 1 of 1	
Company <sup>.</sup> TestAmerica Laboratories, Inc.			Accreditations Required (See note):			Job #: 240-149195-1	<u> </u>
Address 13715 Rider Trail North.	Due Date Requested: 6/13/2021		4	Analysis Requested			Γ
City Earth City	TAT Requested (days):					A - HCL M - Hexane B - NaOH N - None D Ninic Acid D - SNaO2	
State. z.b. MO, 63045							
Phone: 314-298-8566(Tel) 314-298-8757(Fax)	PO #:		teil te				te
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DEM 4004 1240 140405 21	Eastern 11:28		: >			5.0 pCi/L. TVA protocol - Ra-226+228 action limit at	at
UEN-MWY-10001 (240-149130-7)	o/o/21 Eastern				V	5.0 pCi/L.	Ι
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Note: Since laboratory accreditations are subject to change. Eurofins TestAmerica places the ownership of method, analyte & accreditation compliance upon out subcontract laboratories. This sample shipment is forwarded under chain-of-custody. If the laboratory does not currently maintain accreditation in the State of Onigin listed above for analyses/tests/matrix being analyzed, to the samples must be shipped back to the Eurofins TestAmerica alboratory or other instructions will be provided. Any changes to accreditations 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 complicance to Eurofins TestAmerica.	ica places the ownership of method. x being analyzed, the samples must o date. return the signed Chain of C.	analyte & accreditation or be shipped back to the E ustody attesting to said co	compliance upon out subcontract labora Eurofins TestAmerica laboratory or othe omplicance to Eurofins TestAmerica.	t instructions will be provided. Any ch	I I I I I I I I I I I I I I I I I I I	custody. If the laboratory does not current n status should be brought to Eurofins	1
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Custody Seals Intact: Custody Seal No.: $\Delta$ Yes $\Delta$ No			Cooler Temperature(s	Cooler Temperature(s) °C and Other Remarks:		-	
			-			Ver: 11/01/2020	

#### Login Sample Receipt Checklist

Client: TRC Environmental Corporation.

#### Login Number: 149195 List Number: 2 Creator: Worthington, Sierra M

List Source: Eurofins TestAmerica, St. Louis

Job Number: 240-149195-1

Creator: worthington, Sierra M		
Question	Answer	Comment
Radioactivity wasn't checked or is = background as measured by a survey meter.</td <td>True</td> <td></td>	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	



## October 2021 Assessment Monitoring Data Summary and Statistical Evaluation

DE Karn, Bottom Ash Pond CCR Unit

Essexville, Michigan

January 2022

Darby Litz/ Hydrogeologist/Project Manager

**Prepared For:** Consumers Energy Company

Prepared By: TRC

1540 Eisenhower Place Ann Arbor, Michigan 48108

Kristin Lowery, E.I.T. Project Engineer



### TABLE OF CONTENTS

1.0	Intro	oduction	.1
	1.1	Program Summary	.1
	1.2	Site Overview	
	1.3	Geology/Hydrogeology	4
2.0	Grou	undwater 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	Ass	essment Monitoring Statistical Evaluation	9
	3.1	Establishing Groundwater Protection Standards	9
	3.2	Data Comparison to Groundwater Protection Standards	9
4.0	Con	clusions and Recommendations1	1
5.0	Refe	erences1	2

#### 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						
рН	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 <sup>1</sup> )							
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

<sup>&</sup>lt;sup>1</sup> 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:

<u>Constituent</u>	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<sup>™</sup> 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

	тос		Screen Interval	Octobe	er 4, 2021
Well Location	Elevation (ft)	Geologic Unit of Screen Interval	Elevation (ft)	Depth to Water (ft BTOC)	Groundwater Elevation (ft)
Background	ļ	Ļ	ļļ.	, ,	( )
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 Pon	d		• •		
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 Pon	d & Karn Lined Im	poundment			
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			587.5 to 582.5	21.66	586.24
OW-12	/-12 603.07 Silty Sand		584.2 to 579.2	17.10	585.97
DEK Nature and Exter	nt		1		
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 Lev	el		•		
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 2Summary of Field Parameters: October 2021DE Karn Bottom Ash Pond – RCRA CCR Monitoring Program<br/>Essexville, Michigan

Sample Location	Sample Date	Dissolved Oxygen	Oxidation Reduction Potential	рН	Specific Conductivity	Temperature	Turbidity
		(mg/L)	(mV)	(SU)	(umhos/cm)	(°C)	(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 Po	ond						
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	
					Sample Date:	10/7/2021	10/6/2021	10/7/2021	1
				MI Non-			Dealer		
Constituent	Unit	EPA MCL	MI Residential*	Residential*	MI GSI^		Васко	ground	
Appendix III <sup>(1)</sup>									ł
Boron	ug/L	NC	500	500	4,000	51	204	661	1
Calcium	mg/L	NC	NC	NC	500 <sup>EE</sup>	76.8	116	236	ł
Chloride	mg/L	250**	250 <sup>E</sup>	250 <sup>E</sup>	50	146	197	138	1
Fluoride	ug/L	4,000	NC	NC	NC	< 1,000	< 1,000	< 1,000	1
Sulfate	mg/L	250**	250 <sup>E</sup>	250 <sup>E</sup>	500 <sup>EE</sup>	3.76	11.6	433	1
Total Dissolved Solids	mg/L	500**	500 <sup>E</sup>	500 <sup>E</sup>	500	290	810	1,140	1
pH, Field	SU	6.5 - 8.5**	6.5 - 8.5 <sup>E</sup>	6.5 - 8.5 <sup>≞</sup>	6.5 - 9.0	7.0	6.6	6.9	ł
Appendix IV <sup>(1)</sup>									ł
Antimony	ug/L	6	6.0	6.0	2.0	< 1	< 1	< 1	1
Arsenic	ug/L	10	10	10	10	3	3	8	1
Barium	ug/L	2,000	2,000	2,000	1,200	85	65	63	1
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	1
Chromium	ug/L	100	100	100	11	< 1	2	< 1	1
Cobalt	ug/L	NC	40	100	100	< 6	< 6	< 6	1
Fluoride	ug/L	4,000	NC	NC	NC	< 1,000	< 1,000	< 1,000	1
Lead	ug/L	NC	4.0	4.0	14	< 1	< 1	< 1	ł
Lithium	ug/L	NC	170	350	440	< 10	30	85	1
Mercury	ug/L	2	2.0	2.0	0.20#	< 0.2	< 0.2	< 0.2	ł
Molybdenum	ug/L	NC	73	210	120	< 5	< 5	7	ł
Radium-226	pCi/L	NC	NC	NC	NC	0.775	1.05	0.934	1
Radium-228	pCi/L	NC	NC	NC	NC	< 0.582	1.11	< 0.478	ł
Radium-226/228	pCi/L	5	NC	NC	NC	1.00	2.16	1.33	i
Selenium	ug/L	50	50	50	5.0	< 1	< 1	2	ł
Thallium	ug/L	2	2.0	2.0	2.0	< 2	< 2	< 2	ł
Additional MI Part 115 <sup>(2)</sup>									ł
Iron	ug/L	300**	300 <sup>E</sup>	300 <sup>E</sup>	500,000EE	2,810	14,500	2,670	ł
Copper	ug/L	1,000**	1,000 <sup>E</sup>	1,000 <sup>E</sup>	20	< 1	< 1	1	1
Nickel	ug/L	NC	100	100	120	4	6	14	1
Silver	ug/L	100**	34	98	0.2	< 0.2	< 0.2	< 0.2	1
Vanadium	ug/L	NC	4.5	62	27	< 2	6	< 2	
Zinc	ug/L	5,000**	2,400	5,000 <sup>E</sup>	260	< 10	< 10	< 10	ł

#### 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.

<sup>E</sup> - 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.

MW-15019
10/7/2021
351
165
363
< 1,000
58.3
1,130
6.4
-
< 1
< 1 3
283
< 1
< 0.2
< 1
< 6
< 1,000
< 1
15
< 0.2
< 5
1.42
< 0.424
1.72
< 1
< 2
20,900
< 1
7
< 0.2
2
< 10

# 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
				MI Non-		dou un arro dio o t		adia at		alau wa awa alia wa	
Constituent	Unit	EPA MCL	MI Residential*	Residential*	MI GSI^	downgradient	upgra	adient		downgradient	
Appendix III <sup>(1)</sup>											
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 <sup>EE</sup>	73.1	24.5	65.8	102	117	71
Chloride	mg/L	250**	250 <sup>E</sup>	250 <sup>E</sup>	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 <sup>E</sup>	250 <sup>E</sup>	500 <sup>EE</sup>	58.3	39.7	143	57.2	209	118
Total Dissolved Solids	mg/L	500**	500 <sup>E</sup>	500 <sup>E</sup>	500	599	253	530	546	712	494
pH, Field	SU	6.5 - 8.5**	6.5 - 8.5 <sup>E</sup>	6.5 - 8.5 <sup>E</sup>	6.5 - 9.0	7.1	8.3	7.1	7.1	7.3	7.4
Appendix IV <sup>(1)</sup>											
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 <sup>(</sup>	2)										
Iron	ug/L	300**	300 <sup>E</sup>	300 <sup>E</sup>	500,000 <sup>EE</sup>	128	103	2,440	916	1,300	1,190
Copper	ug/L	1,000**	1,000 <sup>E</sup>	1,000 <sup>E</sup>	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 <sup>E</sup>	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**



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# 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

SLURRY WALL (APPROXIMATE)

03

LINED IMPOUNDMENT (COVENANT BOUNDARY)

# <u>NOTES</u>

- 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).
- 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.



1 " = 1,000

1:12,000

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

2,000

#### KARN AND WEADOCK COMPLEX AREA

DRAWN BY:	R. BARBER	PROJ NO.:	367388-001
CHECKED BY:	K. LOWERY		
APPROVED BY:	D. LITZ	FIGUR	F 2
DATE:	JANUARY 2022		



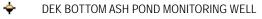
1540 Eisenhower Place Ann Arbor, MI 48108-3284 Phone: 734.971.7080 www.trccompanies.com

FILE NO

367388-001-005.mxd



# LEGEND



- 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)

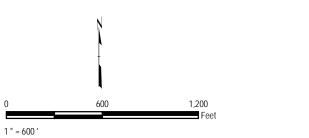


LINED IMPOUNDMENT (COVENANT BOUNDARY) GROUNDWATER ELEVATION CONTOUR (1' INTERVAL, DASHED WHERE INFERRED)

(580.50) GROUNDWATER ELEVATION (FEET)

## <u>NOTES</u>

- 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.



1:7,200

PROJECT:

#### CONSUMERS ENERGY COMPANY DE KARN POWER PLANT ESSEXVILLE, MICHIGAN

#### SHALLOW GROUNDWATER CONTOUR MAP OCTOBER 2021

DRAWN BY:	A. ADAIR	PROJ NO.:	418425.0001
CHECKED BY:	J. KRENZ		
APPROVED BY:	D. LITZ	FIGURE	3
DATE:	JANUARY 2022		•



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

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		
MW-15008	10/6/2021	Radium 226,	
MW-15016	10/7/2021	Combined	Potential false positive results due to equipment blank contamination.
MW-15019	10/7/2021	Radium	
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		reiterit retuvery in Loo above chiena, results are potentially blased high.

# 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		
DEK-MW-15004	10/4/2021		
DEK-MW-15005	10/4/2021	Radium 228	Percent recovery in LCS above criteria; results are potentially biased high.
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
То:	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 <sup>1</sup> 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

<sup>&</sup>lt;sup>1</sup> 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).

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 Guidance <sup>2</sup>, 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

<sup>&</sup>lt;sup>2</sup> 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<sup>TM</sup> statistical software. Sanitas<sup>TM</sup> is a software tool that is commercially available for performing statistical evaluation consistent with procedures outlined in the Unified Guidance. Within the Sanitas<sup>TM</sup> 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 test<sup>3</sup> 99 percent confidence level, i.e., a significance level ( $\alpha$ ) of 0.01. The following narrative describes the methods employed, the results obtained and the Sanitas<sup>TM</sup> 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<sup>™</sup> 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

<sup>&</sup>lt;sup>3</sup> 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<sup>TM</sup> 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<sup>™</sup> 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<sup>™</sup> Output Files

# Table

Sample Location:							DEK-MW-15002									
		1			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												Field Dup				
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	< 1000		
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	< 1000		
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.

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									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	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	< 1000
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	< 1000
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.

Sample Location:							DEK-MW-15006								
	-	8	•		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 <sup>(1)</sup>	< 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.

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				downgi	radient			
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.

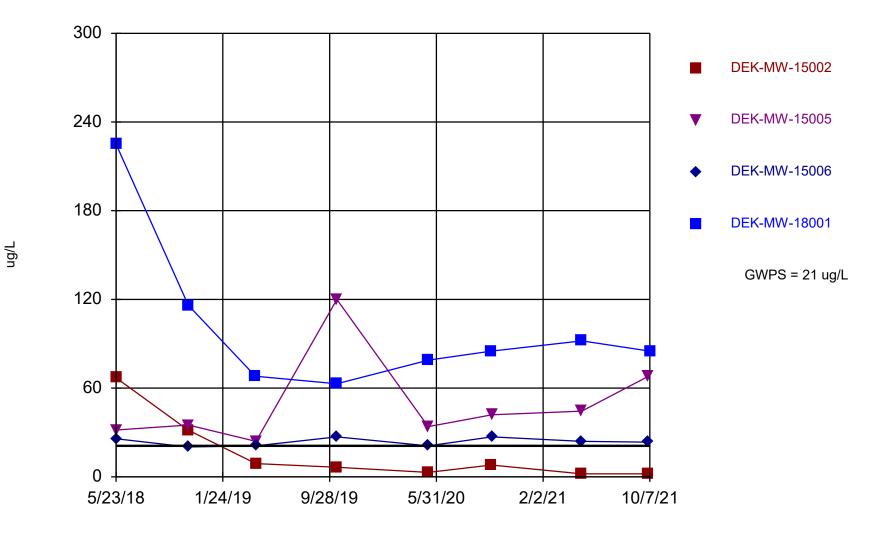
Bold value indicates an exceedance of the GWPS. Data from downgradient monitoring wells are screened against the

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.

# 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

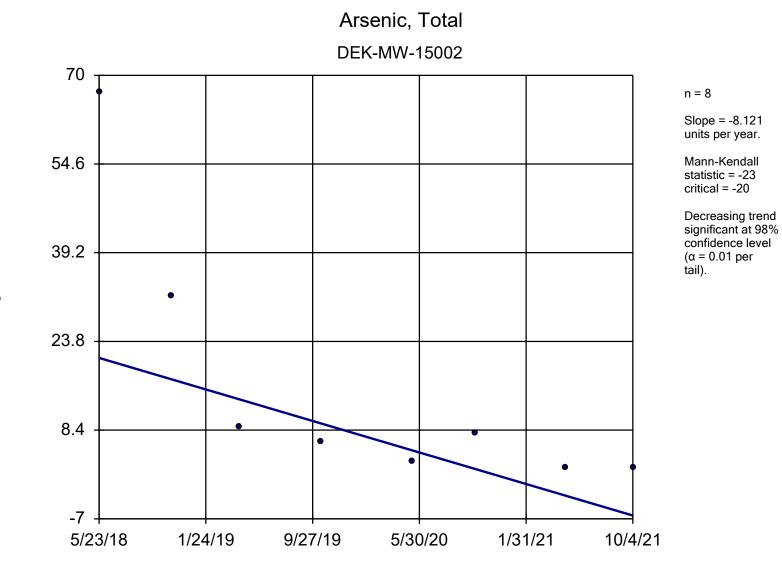
# **Summary Report**

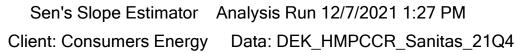
Constituent: Arsenic, Total Analysis Run 12/7/2021 1:25 PM Client: Consumers Energy Data: DEK\_HMPCCR\_Sanitas\_21Q4

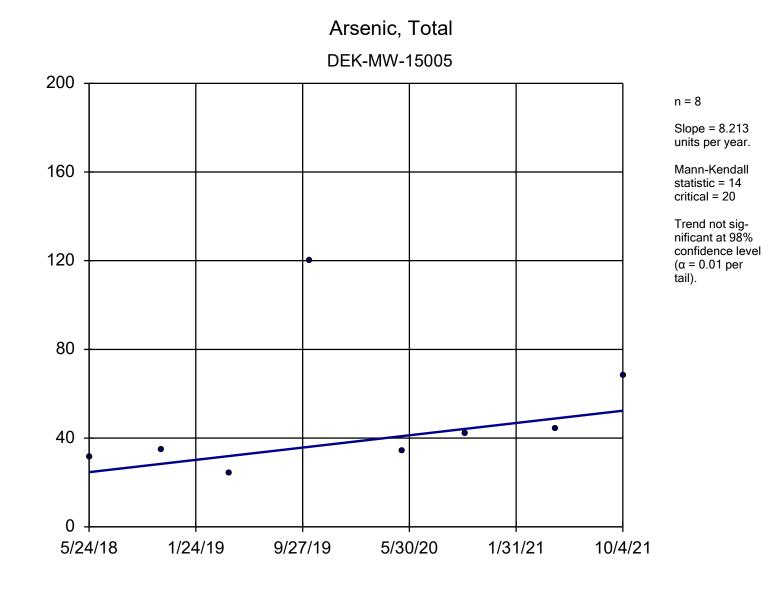
For observations made between 5/23/2018 and 10/7/2021, a summary of the selected data set:

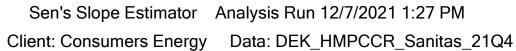
Observations = 32 ND/Trace = 0 Wells = 4 Minimum Value = 2 Maximum Value = 225 Mean Value = 47.84 Median Value = 31.7 Standard Deviation = 45.99 Coefficient of Variation = 0.9613 Skewness = 1.981

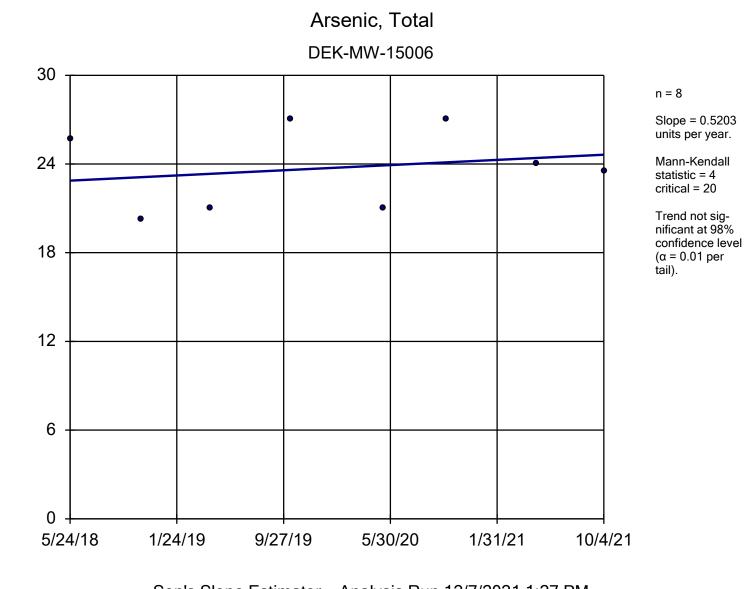
Well	<u>#Obs.</u>	ND/Trace	Min	Max	Mean	Median	Std.Dev.	CV	Skewness
DEK-MW-15002	8	0	2	67	16.15	7.25	22.71	1.406	1.635
DEK-MW-15005	8	0	24	120	49.9	38.5	31.19	0.6251	1.606
DEK-MW-15006	8	0	20.25	27	23.68	23.75	2.736	0.1155	0.01798
DEK-MW-18001	8	0	63	225	101.6	85	52.38	0.5155	1.874



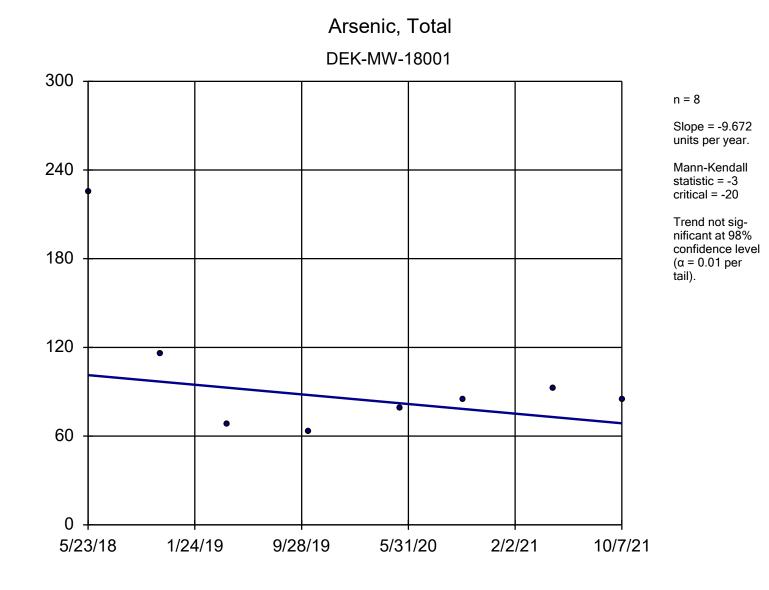


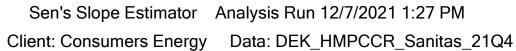






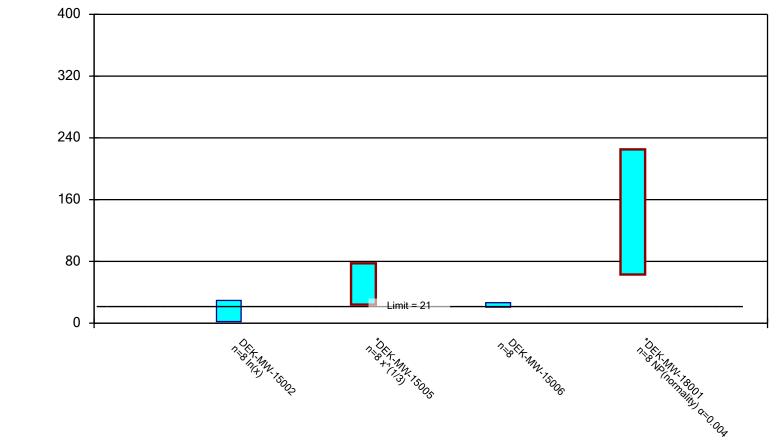
Sen's Slope Estimator Analysis Run 12/7/2021 1:27 PM Client: Consumers Energy Data: DEK\_HMPCCR\_Sanitas\_21Q4





# 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.



ng/L

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

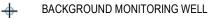
	DEK-MW-15002	DEK-MW-15005	DEK-MW-15006	DEK-MW-18001
5/23/2018	67			225
5/24/2018		31.7	25.7	
11/5/2018	31.7		20.25 (D)	
11/6/2018		35		116
4/10/2019				68
4/11/2019	9	24 (D)	21	
10/15/2019	6.5	120 (D)	27	63
5/13/2020	3	34 (D)	21	
5/14/2020				79
10/6/2020	8 (D)			85
10/7/2020		42	27	
5/3/2021	2	44.5 (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



BEDROCK MONITORING WELL

- ÷ DEK BOTTOM ASH POND MONITORING WELL
- JCW BOTTOM ASH POND MONITORING WELL
- JCW LANDFILL MONITORING WELL -🔶
- SURFACE WATER GAUGING STATION Ξ
- SLURRY WALL (APPROXIMATE)



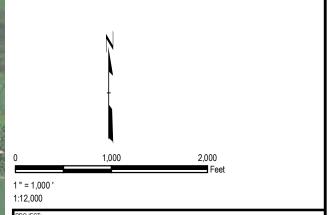
GROUNDWATER ELEVATION CONTOUR (2' INTERVAL, DASHED WHERE INFERRED)

(580.85)

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. 2
- NOAA/NATIONAL OCEANIC SERVICE GREAT LAKES 3. GAUGING STATION, ESSEXVILLE, MI (ID: 9075035).



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

SHALLOW GROUNDWATER CONTOUR MAP **DECEMBER 2015** 

DRAWN BY:	J. PAPEZ	PROJ NO.:	269767-002/3
CHECKED BY:	D. LITZ		
APPROVED BY:	G. CROCKFORD		FIGURE 1
DATE:	OCTOBER 2017		
	RC		1540 Eisenhower Place Ann Arbor, MI 48108-3284 Phone: 734.971.7080 www.trcsolutions.com

www.trcsolutions.com 269767-002\_3-001.mxd



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BEDROCK MONITORING WELL

DEK BOTTOM ASH POND MONITORING WELL

JCW BOTTOM ASH POND MONITORING WELL

JCW LANDFILL MONITORING WELL -🔶

Ξ SURFACE WATER GAUGING STATION

SLURRY WALL (APPROXIMATE)



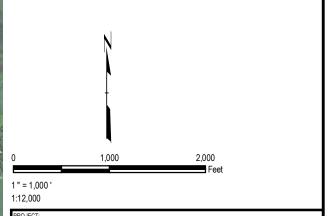
GROUNDWATER ELEVATION CONTOUR (2' INTERVAL, DASHED WHERE INFERRED)

(580.85)

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. 2
- NOAA/NATIONAL OCEANIC SERVICE GREAT LAKES 3. GAUGING STATION, ESSEXVILLE, MI (ID: 9075035).



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

SHALLOW GROUNDWATER CONTOUR MAP **MARCH 2016** 

DRAWN BY:	J. PAPEZ	PROJ NO.: 269767-002	/3
CHECKED BY:	D. LITZ		
APPROVED BY:	G. CROCKFORD	FIGURE 2	
DATE:	OCTOBER 2017		
<b>©TRC</b>		1540 Eisenhower Place Ann Arbor, MI 48108-3284 Phone: 734.971.7080 www.trcsolutions.com	

Phone: 734.971.7080 www.trcsolutions.com

269767-002\_3-002.mxd



## <u>LEGEND</u>



- BEDROCK MONITORING WELL

DEK BOTTOM ASH POND MONITORING WELL

JCW BOTTOM ASH POND MONITORING WELL

■ SURFACE WATER GAUGING STATION

SLURRY WALL (APPROXIMATE)



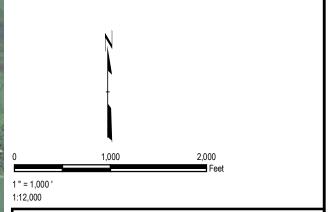
GROUNDWATER ELEVATION CONTOUR (2' INTERVAL, DASHED WHERE INFERRED)

(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).



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

SHALLOW GROUNDWATER CONTOUR MAP MAY 2016

DRAWN BY:	J. PAPEZ	PROJ NO.:	269767-002/3
CHECKED BY:	D. LITZ		
APPROVED BY:	G. CROCKFORD		FIGURE 3
DATE:	OCTOBER 2017		
<b>©</b> TRC			1540 Eisenhower Place Ann Arbor, MI 48108-3284 Phone: 734.971.7080 www.trcsolutions.com

www.trcsolutions.com 269767-002\_3-003.mxd





BEDROCK MONITORING WELL

÷ DEK BOTTOM ASH POND MONITORING WELL

JCW BOTTOM ASH POND MONITORING WELL

JCW LANDFILL MONITORING WELL -�

SURFACE WATER GAUGING STATION Ξ

SLURRY WALL (APPROXIMATE)



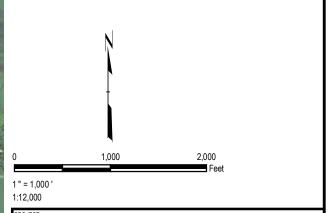
GROUNDWATER ELEVATION CONTOUR (2' INTERVAL, DASHED WHERE INFERRED)

(580.85)

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. 2
- NOAA/NATIONAL OCEANIC SERVICE GREAT LAKES 3. GAUGING STATION, ESSEXVILLE, MI (ID: 9075035).



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

SHALLOW GROUNDWATER CONTOUR MAP AUGUST 2016

DRAWN BY:	J. PAPEZ	PROJ NO.:	269767-002/3
CHECKED BY:	D. LITZ		
APPROVED BY:	G. CROCKFORD		FIGURE 4
DATE:	OCTOBER 2017		
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Phone: 734.971.7080 www.trcsolutions.com

269767-002\_3-004.mxd



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BEDROCK MONITORING WELL

DEK BOTTOM ASH POND MONITORING WELL

JCW BOTTOM ASH POND MONITORING WELL

JCW LANDFILL MONITORING WELL -🔶

Ξ SURFACE WATER GAUGING STATION

SLURRY WALL (APPROXIMATE)



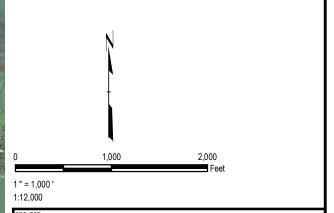
GROUNDWATER ELEVATION CONTOUR (2' INTERVAL, DASHED WHERE INFERRED)

(580.85)

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. 2
- NOAA/NATIONAL OCEANIC SERVICE GREAT LAKES 3. GAUGING STATION, ESSEXVILLE, MI (ID: 9075035).



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

SHALLOW GROUNDWATER CONTOUR MAP **NOVEMBER 2016** 

DRAWN BY:	J. PAPEZ	PROJ NO.: 269767-002/
CHECKED BY:	D. LITZ	
APPROVED BY:	G. CROCKFORD	FIGURE 5
DATE:	OCTOBER 2017	
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www.trcsolutions.com 269767-002\_3-005.mxd



## <u>LEGEND</u>

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BEDROCK MONITORING WELL

DEK BOTTOM ASH POND MONITORING WELL

JCW BOTTOM ASH POND MONITORING WELL

■ SURFACE WATER GAUGING STATION

SLURRY WALL (APPROXIMATE)



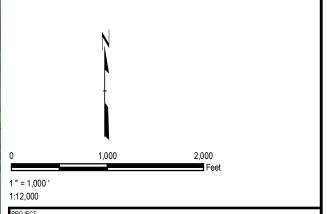
GROUNDWATER ELEVATION CONTOUR (2' INTERVAL, DASHED WHERE INFERRED)

(580.85)

GROUNDWATER ELEVATION (FEET, MSL)

## <u>NOTES</u>

- 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).



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

SHALLOW GROUNDWATER CONTOUR MAP FEBRUARY 2017

DRAWN BY:	J. PAPEZ	PROJ NO.:	269767-002/3
CHECKED BY:	D. LITZ		
APPROVED BY:	G. CROCKFORD		FIGURE 6
DATE:	OCTOBER 2017		
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BEDROCK MONITORING WELL

÷ DEK BOTTOM ASH POND MONITORING WELL

JCW BOTTOM ASH POND MONITORING WELL

JCW LANDFILL MONITORING WELL -🔶

SURFACE WATER GAUGING STATION Ξ

SLURRY WALL (APPROXIMATE)



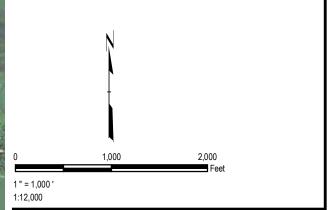
GROUNDWATER ELEVATION CONTOUR (2' INTERVAL, DASHED WHERE INFERRED)

(580.85)

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. 2
- NOAA/NATIONAL OCEANIC SERVICE GREAT LAKES 3. GAUGING STATION, ESSEXVILLE, MI (ID: 9075035).



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

SHALLOW GROUNDWATER CONTOUR MAP MAY 2017

DRAWN BY:	J. PAPEZ	PROJ NO.:	269767-002/3
CHECKED BY:	D. LITZ		
APPROVED BY:	G. CROCKFORD		FIGURE 7
DATE:	OCTOBER 2017		
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## <u>LEGEND</u>

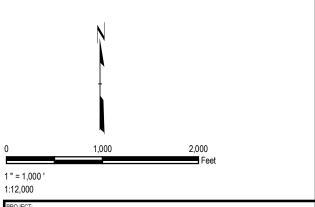
- BEDROCK MONITORING WELL
- DEK BOTTOM ASH POND MONITORING WELL
- ► JCW BOTTOM ASH POND MONITORING WELL
- SURFACE WATER GAUGING STATION
- SLURRY WALL (APPROXIMATE)
- ← G(2

GROUNDWATER ELEVATION CONTOUR (2' INTERVAL, DASHED WHERE INFERRED) GROUNDWATER ELEVATION (FEET, MSL)

(580.85)

### <u>NOTES</u>

- 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).



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

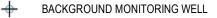
SHALLOW GROUNDWATER CONTOUR MAP AUGUST 2017

DRAWN BY:	J. PAPEZ	PROJ NO.:	269767-002/3
CHECKED BY:	D. LITZ		
APPROVED BY:	G. CROCKFORD		FIGURE 8
DATE:	OCTOBER 2017		
<b>©</b> TRC			1540 Eisenhower Place Ann Arbor, MI 48108-3284 Phone: 734.971.7080 www.trcsolutions.com

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- DEK BOTTOM ASH POND MONITORING WELL
- JCW BOTTOM ASH POND MONITORING WELL
- SURFACE WATER GAUGING STATION
- MONITORING WELL (STATIC WATER LEVEL ONLY)
- SLURRY WALL (APPROXIMATE)

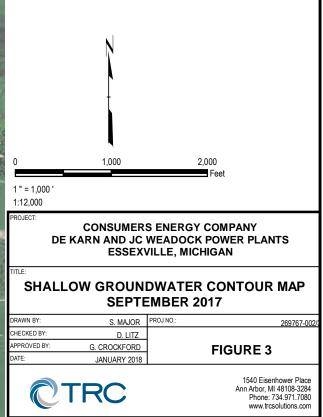
GROUNDWATER ELEVATION CONTOUR (2' INTERVAL, DASHED WHERE INFERRED)



GROUNDWATER ELEVATION (FEET, MSL)

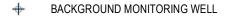
## <u>NOTES</u>

- 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).



269767-002\_3-021.mx





- DEK BOTTOM ASH POND & LINED IMPOUNDMENT MONITORING WELL
- ÷ DEK BOTTOM ASH POND MONITORING WELL
- DEK LINED IMPOUNDMENT MONITORING WELL
- ø 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)

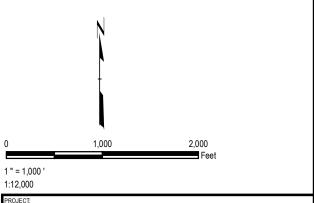
GROUNDWATER ELEVATION CONTOUR (2' INTERVAL, DASHED WHERE INFERRED)

(580.85)

GROUNDWATER ELEVATION (FEET, MSL)

## NOTES

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



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

SHALLOW GROUNDWATER CONTOUR MAP **APRIL 2018** 

DRAWN BY:	S. MAJOR	PROJ NO.:	290805-001
CHECKED BY:	C. SCIESZKA		
APPROVED BY:	D. LITZ	FIC	GURE 2
DATE:	OCTOBER 2018		
<b>©</b> TRC			1540 Eisenhower Place Ann Arbor, MI 48108-3284 Phone: 734.971.7080 www.trcsolutions.com

290805-001-001x m



- + 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 Ø
- -¢-EXTRACTION WELL
- -**b**-JCW BEDROCK MONITORING WELL
- JCW BOTTOM ASH POND MONITORING WELL ÷
- -�-JCW LANDFILL MONITORING WELL
- MONITORING WELL (STATIC WATER LEVEL ONLY)
- PIEZOMETER

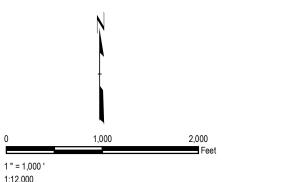
GROUNDWATER ELEVATION CONTOUR (2' INTERVAL, DASHED WHERE INFERRED)

SLURRY WALL (APPROXIMATE)

GROUNDWATER ELEVATION (FEET, MSL) (580.85)

## NOTES

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



## 1:12,000

## ROJECT

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

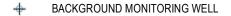
SHALLOW GROUNDWATER CONTOUR MAP MAY 2018

DRAWN BY:	S. MAJOR	PROJ NO.: 290805-
CHECKED BY:	C. SCIESZKA	
APPROVED BY:	D. LITZ	FIGURE 3
DATE:	OCTOBER 2018	
<b>©</b> TRC		1540 Eisenhower Place Ann Arbor, MI 48108-3284 Phone: 734 971.7080 www.tresolutions.com

Phone: 734.971.7080 www.trcsolutions.com

290805-001-005 m





- ✤ 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

EXTENT OF GEOSYNTHETICS

(KARN LINED IMPOUNDMENT)

SLURRY WALL (APPROXIMATE)



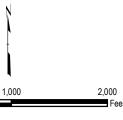
GROUNDWATER ELEVATION CONTOUR (2' INTERVAL, DASHED WHERE INFERRED)

(580.50) GROUNDWATER ELEVATION (FEET)

(NM) NOT MEASURED

#### <u>NOTES</u>

- 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.



1 " = 1,000 '

1:12,000 PROJECT:

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

#### SHALLOW GROUNDWATER CONTOUR MAP NOVEMBER 2018

DRAWN BY:	S. MAJOR	PROJ NO.:	322173-001
CHECKED BY:	J. KRENZ		
APPROVED BY:	D. LITZ	FIGURE	2
DATE:	MARCH 2019	. ISSNE	-
		1540 Fig	enhower Place

**C**TRC

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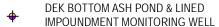
290805-001-022.mxd



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

Plot Date: 1/29/2020, 16:24:18 PM by MVAPHIADIS -- LAYOUT: ANSI B(11"x17") Path: F-\ConsumersEnerw\CCR\_GM2017\_269767332172\_3-004-02 mxd

## LEGEND

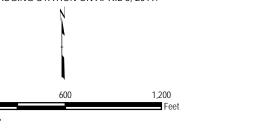


- DEK BOTTOM ASH POND MONITORING WELL
- DEK LINED IMPOUNDMENT MONITORING WELL
- ✤ DECOMMISSIONED MONITORING WELL
- ✤ MONITORING WELL (STATIC ONLY)
- SURFACE WATER GAUGING STATION
- +- NATURE AND EXTENT WELL
- SLURRY WALL (APPROXIMATE)
- EXTENT OF GEOSYNTHETICS (KARN LINED IMPOUNDMENT)
- GROUNDWATER ELEVATION CONTOUR (2' INTERVAL, DASHED WHERE INFERRED)
- (580.50) GROUNDWATER ELEVATION (FEET)

(NM) NOT MEASURED

## <u>NOTES</u>

- 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.





#### CONSUMERS ENERGY COMPANY DE KARN POWER PLANT ESSEXVILLE, MICHIGAN

#### SHALLOW GROUNDWATER CONTOUR MAP APRIL 2019

DRAWN BY:	S. MAJOR	PROJ NO.: 322173-00
CHECKED BY:	J. KRENZ	
APPROVED BY:	D. LITZ	FIGURE 3
DATE:	JANUARY 2020	i ioone o



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

FILE NO.:

POND B5

322172\_3-004-02.mxd



Dordinate System: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl (Foo

 Plot Date:
 1/29/2020, 16:23:59 PM by MVAPHIADIS
 LAYOUT: ANSI B(11"x17"

 Path:
 F-\ConsumersEnergy(CCR\_GMX0117\_2607817\_3-005-07)
 Amount

## 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
- 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).
- 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.





......

POND B5

:7,200 ROJECT:

#### CONSUMERS ENERGY COMPANY DE KARN POWER PLANT ESSEXVILLE, MICHIGAN

1,200

#### SHALLOW GROUNDWATER CONTOUR MAP OCTOBER 2019

DRAWN BY:	S. MAJOR	PROJ NO.: 322172-001
CHECKED BY:	J. KRENZ	
APPROVED BY:	D. LITZ	FIGURE 4
DATE:	JANUARY 2020	

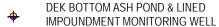


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FILE NO.

322172\_3-005-02.mxd



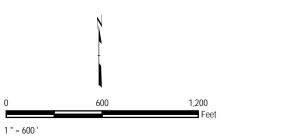


- DEK BOTTOM ASH POND MONITORING WELL
- ➡ DEK LINED IMPOUNDMENT MONITORING WELL
- -
- ✤ MONITORING WELL (STATIC ONLY)
- SURFACE WATER GAUGING STATION
- +- NATURE AND EXTENT WELL
- SLURRY WALL (APPROXIMATE)
- EXTENT OF GEOSYNTHETICS (KARN LINED IMPOUNDMENT) GROUNDWATER ELEVATION CONTOUR
- (1' INTERVAL, DASHED WHERE INFERRED)
- (580.50) GROUNDWATER ELEVATION (FEET)

(NM) NOT MEASURED

## <u>NOTES</u>

- 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.



1:7,200 PROJECT:

<u>MW-16</u>

#### CONSUMERS ENERGY COMPANY DE KARN POWER PLANT ESSEXVILLE, MICHIGAN

#### SHALLOW GROUNDWATER CONTOUR MAP MAY 11, 2020

DRAWN BY:	S. MAJOR	PROJ NO.:	367388.0001
CHECKED BY:	J. KRENZ		
APPROVED BY:	D. LITZ	FIGURE 3	
DATE:	JULY 2020	1.001(2.0	



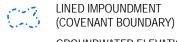
1540 Eisenhower Place Ann Arbor, MI 48108-3284 Phone: 734.971.7080 www.trccompanies.com

367388-001-006.mxd





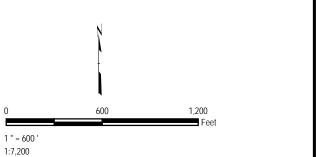
- DEK BOTTOM ASH POND MONITORING WELL
- DEK LINED IMPOUNDMENT MONITORING WELL
- DECOMMISSIONED MONITORING WELL
- ✤ MONITORING WELL (STATIC ONLY)
- SURFACE WATER GAUGING STATION
- NATURE AND EXTENT WELL
- SLURRY WALL (APPROXIMATE)



- GROUNDWATER ELEVATION CONTOUR
  (1' INTERVAL, DASHED WHERE INFERRED)
- (580.50) GROUNDWATER ELEVATION (FEET)

## <u>NOTES</u>

- 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

#### SHALLOW GROUNDWATER CONTOUR MAP OCTOBER 5, 2020

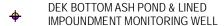
DRAWN BY:	S. MAJOR	PROJ NO.:	367388.0001
CHECKED BY:	J. KRENZ		
APPROVED BY:	D. LITZ	FIGURE	3
DATE:	JANUARY 2021		0



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367388-001-012.mxd





- ÷ DEK BOTTOM ASH POND MONITORING WELL
- + DEK LINED IMPOUNDMENT MONITORING WELL
- DECOMMISSIONED MONITORING WELL ø
- MONITORING WELL (STATIC ONLY)
- SURFACE WATER GAUGING STATION \_
- NATURE AND EXTENT WELL -0-
- SLURRY WALL (APPROXIMATE)

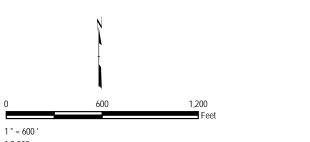


LINED IMPOUNDMENT (COVENANT BOUNDARY)

- GROUNDWATER ELEVATION CONTOUR (1' INTERVAL, DASHED WHERE INFERRED)
- (580.50) GROUNDWATER ELEVATION (FEET)

## NOTES

- 1. BASE MAP IMAGERY FROM GOOGLE EARTH PRO, 2018.
- WELL LOCATIONS SURVEYED BY ROWE PROFESSIONAL 2. SERVICES COMPANY ON 11/4/2015.
- NOAA/NATIONAL OCEANIC SERVICE GREAT LAKES GAUGING 3 STATION, ESSEXVILLE, MI (ID: 9075035).
- GROUNDWATER ELEVATIONS DISPLAYED IN FEET RELATIVE TO THE NORTH AMERICAN VERTICAL DATUM OF 1988.



1:7,200 ROJECT

#### CONSUMERS ENERGY COMPANY DE KARN POWER PLANT ESSEXVILLE, MICHIGAN

#### SHALLOW GROUNDWATER CONTOUR MAP MAY 3, 2021

DRAWN BY:	A. ADAIR	PROJ NO.:	418425.0001
CHECKED BY:	J. KRENZ		
APPROVED BY:	L. DARBY	FIGUE	RF 3
DATE:	JULY 2021		



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418425-201-012 m





- ÷ DEK BOTTOM ASH POND MONITORING WELL
- + DEK LINED IMPOUNDMENT MONITORING WELL
- DECOMMISSIONED MONITORING WELL ø
- MONITORING WELL (STATIC ONLY)
- SURFACE WATER GAUGING STATION =
- NATURE AND EXTENT WELL -0-
- SLURRY WALL (APPROXIMATE)

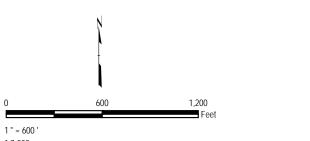


LINED IMPOUNDMENT (COVENANT BOUNDARY) GROUNDWATER ELEVATION CONTOUR

- (1' INTERVAL, DASHED WHERE INFERRED)
- (580.50) GROUNDWATER ELEVATION (FEET)

## NOTES

- 1. BASE MAP IMAGERY FROM GOOGLE EARTH PRO, 2018.
- WELL LOCATIONS SURVEYED BY ROWE PROFESSIONAL 2. SERVICES COMPANY ON 11/4/2015.
- NOAA/NATIONAL OCEANIC SERVICE GREAT LAKES GAUGING 3 STATION, ESSEXVILLE, MI (ID: 9075035).
- GROUNDWATER ELEVATIONS DISPLAYED IN FEET RELATIVE TO THE NORTH AMERICAN VERTICAL DATUM OF 1988.



1:7,200 ROJECT

MW-16

#### CONSUMERS ENERGY COMPANY DE KARN POWER PLANT ESSEXVILLE, MICHIGAN

#### SHALLOW GROUNDWATER CONTOUR MAP MAY 3, 2021

DRAWN BY:	A. ADAIR	PROJ NO.:	418425.0001
CHECKED BY:	J. KRENZ		
APPROVED BY:	L. DARBY	FIGUR	F 3
DATE:	JULY 2021		- •



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418425-201-012 m



## 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 Other Assessment Monitoring Wells (currently located upgradient)<sup>1</sup>: 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

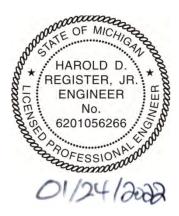
Professional Engineer Certification Statement [40 CFR 257.94(e)2]

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

<sup>&</sup>lt;sup>1</sup> 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

135 W. Trail St.

Jackson, MI 49201

#### **Chemistry Project: 21-1171**

*phone* 517-788-1251 *fax* 517-788-2533

TRC Environmental, Inc. conducted groundwater monitoring at the Karn/Weadock Background Wells area on 10/06/2021 and 10/07/2021, for the 4<sup>th</sup> 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, 22<sup>nd</sup> Edition, 2012.

#### III. <u>Results/Quality Control</u>

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:

Acronym	Description
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>	Description
*	Generic data flag, applicable description added in the corresponding notes section
В	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
Н	The maximum recommended hold time was exceeded
Ι	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
Μ	The precision for duplicate analysis was not met; RPD outside acceptance criteria
Ν	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
Х	Other notation required; comment listed in sample notes and/or case narrative



# Customer Name:Karn/Weadock ComplexWork Order ID:Q4\_2021 DEK & JCW RCRA Background WellsDate Received:10/7/2021Chemistry Project:21-1171

Sample #	Field Sample ID	<u>Matrix</u>	Sample Date	<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



Sample Site:

Matrix:

#### **DEK JCW Background** Field Sample ID: MW-15002 Lab Sample ID: 21-1171-01 Groundwater

Laboratory Project:	21-1171
Collect Date:	10/07/2021
Collect Time:	09:08 AM

	leous			/	171-01-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 A	Appendix III-IV To	tal Metals	Ехр	Aliquot #: 21-1	171-01-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 Ar	nalyte List, Cl, F,	SO4, Aqu	eous	Aliquot #: 21-1	171-01-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			A	Aliquot #: 21-	1171-01-C03-A01	Analyst: CLH
Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Total Dissolved Solids	290	m	ig/L	10.0	10/11/2021	AB21-1011-04



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 #: 21-1	171-01-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



Matrix:

Fluoride

#### **DEK JCW Background** Sample Site: Field Sample ID: MW-15008 Lab Sample ID: 21-1171-02 Groundwater

Laboratory Project:	21-1171
Collect Date:	10/06/2021
Collect Time:	04:02 PM

Mercury by EPA 7470A, To				-	171-02-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: CCF	R Rule Appendix III-IV To	tal Metals	з Ехр	Aliquot #: 21-1	171-02-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, CI, F,	SO4, Aqı	ieous	Aliquot #: 21-1	171-02-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
<b>_</b>						

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

ug/L

1000.0

10/14/2021

AB21-1014-08

ND

21-1171 Page 7 of 18



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 #: 21-1	171-02-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



# Sample Site:DEK JCW BackgroundField Sample ID:MW-15016Lab Sample ID:21-1171-03Matrix:Groundwater

Laboratory Project:	21-1171
Collect Date:	10/07/2021
Collect Time:	10:10 AM

Mercury by EPA 7470A, Total, A	-				171-03-C01-A01	Analyst: CLH
Parameter(s)	Result	Flag U	nits	RL	Analysis Date	Tracking
Mercury	ND	ug/	Ľ	0.2	10/14/2021	AB21-1014-03
Metals by EPA 6020B: CCR Rule	e Appendix III-IV To	tal Metals Ex	ip Aliqu	ıot #: 21-1	171-03-C01-A02	Analyst: EB
Parameter(s)	Result	Flag U	nits	RL	Analysis Date	Tracking
Antimony	ND	ug/	L	1.0	10/28/2021	AB21-1028-02
Arsenic	8	ug/	Ľ	1.0	10/28/2021	AB21-1028-02
Barium	63	ug/	Ľ	5.0	10/28/2021	AB21-1028-02
Beryllium	ND	ug/	Ľ	1.0	10/28/2021	AB21-1028-02
Boron	661	ug/	Ľ	20.0	10/28/2021	AB21-1028-02
Cadmium	ND	ug/	Ľ	0.2	10/28/2021	AB21-1028-02
Calcium	236000	ug/	Ľ	1000.0	10/28/2021	AB21-1028-02
Chromium	ND	ug/	Ľ	1.0	10/28/2021	AB21-1028-02
Cobalt	ND	ug/	Ľ	6.0	10/28/2021	AB21-1028-02
Copper	1	ug/	Ľ	1.0	10/28/2021	AB21-1028-02
Iron	2670	ug/	Ľ	20.0	10/28/2021	AB21-1028-02
Lead	ND	ug/	Ľ	1.0	10/28/2021	AB21-1028-02
Lithium	85	ug/	Ľ	10.0	10/28/2021	AB21-1028-02
Magnesium	26400	ug/	Ľ	1000.0	10/28/2021	AB21-1028-02
Molybdenum	7	ug/	Ľ	5.0	10/28/2021	AB21-1028-02
Nickel	14	ug/	Ľ	2.0	10/28/2021	AB21-1028-02
Potassium	20800	ug/	Ľ	100.0	10/28/2021	AB21-1028-02
Selenium	2	ug/	Ľ	1.0	10/28/2021	AB21-1028-02
Silver	ND	ug/	Ľ	0.2	10/28/2021	AB21-1028-02
Sodium	96000	ug/	Ľ	1000.0	10/28/2021	AB21-1028-02
Thallium	ND	ug/	Ľ	2.0	10/28/2021	AB21-1028-02
Vanadium	ND	ug/	Ľ	2.0	10/28/2021	AB21-1028-02
Zinc	ND	ug/	Ľ	10.0	10/28/2021	AB21-1028-02
Anions by EPA 300.0 CCR Rule	Analyte List, CI, F,	SO4, Aqueou	JS Aliqu	ıot #: 21-1	171-03-C02-A01	Analyst: DMW
Parameter(s)	Result		nits	RL	Analysis Date	Tracking
Chloride	138000	ug/	Ľ	1000.0	10/18/2021	- AB21-1014-08
Fluoride	ND	ug/		1000.0	10/14/2021	AB21-1014-08
Sulfate		- 9				AB21-1014-08

Total Dissolved Solids by SM 2540C				Aliquot #: 2	I-1171-03-C03-A01	Analyst: CLH
Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Total Dissolved Solids	1140	m	ng/L	10.0	10/11/2021	AB21-1011-04

21-1171 Page 9 of 18



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 #: 21-1	171-03-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



# Sample Site:DEK JCW BackgroundField Sample ID:MW-15019Lab Sample ID:21-1171-04Matrix:Groundwater

Laboratory Project:	21-1171
Collect Date:	10/07/2021
Collect Time:	08:10 AM

Mercury by EPA 7470A, To	otal, Aqueous			Aliquot #: 21-1	171-04-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: CCF	R Rule Appendix III-IV To	tal Metals	в Ехр	Aliquot #: 21-1	171-04-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, Aqı	ieous	Aliquot #: 21-1	171-04-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	Analysia Data	Treeling
i didiliotoi (b)	Result	Flag Units	RL	Analysis Date	Tracking

21-1171 Page 11 of 18



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 #: 21-1	171-04-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



Field Sample ID: DUP-Background

**DEK JCW Background** 

Sample Site:

Laboratory Project: Collect Date: Collect Time:

21-1171 10/07/2021 12:00 AM

Analyst: CLH

AB21-1014-06

Tracking

Lab Sample ID:	21-1171-05					Collect Tim
Matrix:	Groundwater					
Mercury by EP	A 7470A, Total, Aqu	ieous			Aliquot #: 21-1	171-05-C01-A01
Parameter(s)		Result	Flag	Units	RL	Analysis Date
Mercury		ND		ug/L	0.2	10/14/2021
Metals by EPA 6020B: CCR Rule Appendix III-IV Total Metals Exp						
				<b>I</b> <sup>-</sup>	Aliquot #: 21-1	171-05-C01-A02

Metals by EPA 6020B: CCR Rule	e Appendix III-IV To	tal Metals Exp	Aliquot #: 21-1	171-05-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, CI, F,	SO4, Aqueous	Aliquot #: 21-1	171-05-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 l	Jnits	RL	Analysis Date	Tracking
Total Dissolved Solids	1220	m	g/L	10.0	10/11/2021	AB21-1011-04

21-1171 Page 13 of 18



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

21-1171 Page 14 of 18



Laboratory Project: 21-1171 Collect Date: 10/07/2021 Collect Time: 09:08 AM

Sample Site:DEK JCW BackgroundField Sample ID:FB-MW-15002Lab Sample ID:21-1171-06Matrix:Water

Selenium

Silver

Sodium

Thallium

Vanadium

Mercury by EPA 7470A, Total, Aqueous				Aliquot #: 21-1	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

ND

ND

ND

ND

ND

Zinc	ND	ug/L	10.0	10/28/2021	AB21-1028-02
Anions by EPA 300.0 CCR R	ule Analyte List, CI, F, S	604, Aqueous	Aliquot #: 21-1	171-06-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

ug/L

ug/L

ug/L

ug/L

ug/L

1.0

0.2

1000.0

2.0

2.0

10/28/2021

10/28/2021

10/28/2021

10/28/2021

10/28/2021

AB21-1028-02

AB21-1028-02

AB21-1028-02

AB21-1028-02

AB21-1028-02



Data Qualifiers

Exception Summary

No exceptions occured.

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

Inspection Date: 10 . §. 21	Inspection By: [14	spection By: [W					
Sample Origin/Project Name:Bal							
Shipment Delivered By: Enter the type of s							
	Contraction of the second s	Atal					
Pony FedEx Other/Igand Care (whom)	UPS USPS	Airborne					
Tracking Number:	Shipping Form Attache	ed: Yes No					
Shipping Containers: Enter the type and nu	umber of shipping containers received.						
Cooler (1) Cardboard Bo	x Custom Case	Envelope/Mailer					
Loose/Unpackaged Containers		and the second second second second					
Condition of Shipment: Enter the as-receiv							
Damaged Shipment Observed: Nor		Leaking					
Other							
Shipment Security: Enter if any of the ship	ping containers were opened before receipt	i.					
Shipping Containers Received: Ope	ened Sealed _						
Enclosed Documents: Enter the type of doc							
		Sec.					
CoC Work Request	Air Data Sheet	Other					
Temperature of Containers: Measure the te	emperature of several sample containers.						
As-Received Temperature Range	5412 10.3.22 Samples Received on Ice	: Yes V No					
M&TE # and Expiration 5.8%	2						
$1 \times 1 \times$	<u> </u>						
Number and Type of Containers: Enter th	e total number of sample containers receive	ed.					
Container Type Water	Soil Other	Broken Leakin					
VOA (40mL or 60m) 10							
Quart/Liter (g/p)							
9-oz (amber glass jar)							
2-oz (amber glass)							
125 mL (plastic) 12							
24 mL vial (glass)							
250 \$00 mL (plastic) 5							
Other							

## 76.2g2 not nucled

# **CHAIN OF CUSTODY**

### **CONSUMERS ENERGY COMPANY – LABORATORY SERVICES**

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

**Consumers Energy** 

AMPLING SITI	3:		- A.	PROJECT NUMBER:					ANAL	YSIS REQ	UESTED		Page 1 of 1	
EK & JCW	Backgroun	nd- 2021 Q4			21-1171									SEND REPORT TO: CDBatts
AMPLING TEA	M:			DATE SHIPPED:	5	SITE SKETCHEL		tals		4		HD Register, TRC		
Andr	ew c	5.			CIRCLE ONE: YES NO		Total Metals	Anions	S	Alkaliníty			PHONE:	
CE CONTROL #	SAMPLE DATE	SAMPLE TIME	SAMPLE MATRIX	SAMPLE DESCRIPTION /	SAMPLE DESCRIPTION / LOCATION		# OF CONTAINERS	Tot	Ani	TDS	Alk			REMARKS
21-1171-01	10-7-2	( A08)	GW	MW-15002			5 B	x	x	x	x			
-02	10-6.21	1602	GW	MW-15008			53	x	x	x	x			
-03	10-7-21	1010	GW	MW-15016			5 3	x	x	х	x			
-04	10-7-21	0810	GW	MW-15019			53	х	x	х	x			
-05	10-7-21	112	GW	DUP-Background			53	x	x	x	x			
	10-7-21		W	FB- MW-15C	02		ZK	x	х					
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			10/	07/21 1530		$\checkmark$			5.8					
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21-1171 Page 18 of 18



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

135 W. Trail St.

Jackson, MI 49201

#### **Chemistry Project: 21-1168R**

*phone* 517-788-1251 *fax* 517-788-2533

TRC Environmental, Inc. conducted groundwater monitoring at the DEKarn Bottom Ash Pond Wells area on 10/04/2021 for the 4<sup>th</sup> 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, 22<sup>nd</sup> Edition, 2012.

#### III. <u>Results/Quality Control</u>

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:

Acronym	Description
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>	Description
*	Generic data flag, applicable description added in the corresponding notes section
В	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
Н	The maximum recommended hold time was exceeded
Ι	Dilution required due to matrix interference; reporting limit elevated
J	Estimated due to result found above MDL but below PQL (or RL)
Κ	Reporting limit raised due to matrix interference
Μ	The precision for duplicate analysis was not met; RPD outside acceptance criteria
Ν	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
Х	Other notation required; comment listed in sample notes and/or case narrative



# Customer Name:Karn/Weadock ComplexWork Order ID:Q4-2021 DEK RCRA Bottom Ash Pond WellsDate Received:10/7/2021Chemistry Project:21-1168

<u>Sample #</u>	Field Sample ID	<u>Matrix</u>	Sample Date	<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



# Sample Site:DEK Bottom Ash PondField Sample ID:DEK-MW-15002Lab Sample ID:21-1168-01Matrix:Groundwater

Laboratory Project:	21-1168
Collect Date:	10/04/2021
Collect Time:	01:37 PM

Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
		гіаў			2	-
Mercury	ND		ug/L	0.2	10/14/2021	AB21-1014-03
Metals by EPA 6020B: CCR Rule A	Appendix III-IV To	tal Metals	s Exp	Aliquot #: 21-1	168-01-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 A	nalvte List. Cl. F.	SO4. Aau	ieous	Aliguot #: 21-1	168-01-C02-A01	Analyst: TMR
	······································	, - <b> </b>				

		-		-	-
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 Unit	ts RL	Analysis Date	Tracking
Total Dissolved Solids	599	mg/L	10.0	10/08/2021	AB21-1008-01



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 #: 21-1	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

21-1168 Page 6 of 18



Laboratory Project: Collect Date: Collect Time: 02:46 PM

21-1168 10/04/2021

Sample Site:	<b>DEK Bottom Ash Pond</b>
Field Sample ID:	DEK-MW-15004
Lab Sample ID:	21-1168-02
Matrix:	Groundwater

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 Appe	endix III-IV Total Metals Exp		Aliquot #: 21-1	168-02-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 Analy	te List, CI, F,	SO4, Aqı	ieous	Aliquot #: 21-1	168-02-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				Aliguot #: 21-1	168-02-C03-A01	Analyst: CLH

10tal Di33017cu 001103 Dy 0111 23400			Allquot #. 21-	1100-02-C03-A01	Analyst. CET
Parameter(s)	Result	Flag Units	RL	Analysis Date	Tracking
Total Dissolved Solids	530	mg/L	10.0	10/08/2021	AB21-1008-01



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 #: 21-1	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 Project: 21-1168 Collect Date: 10/04/2021 Collect Time: 11:39 AM

Sample Site:	DEK Bottom Ash Pond
Field Sample ID:	DEK-MW-15005
Lab Sample ID:	21-1168-03
Matrix:	Groundwater

Mercury by EPA 7470A, Total, Aqueou	S			Aliquot #: 21-1	168-03-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		в Ехр	Aliquot #: 21-1	168-03-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 Analyt	e List, CI, F,	SO4, Aqı	ieous	Aliquot #: 21-1	168-03-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 #· 21-1	168-03-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



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 #: 21-1	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



Analyst: CLH

AB21-1014-03

Analyst: EB

AB21-1028-02

AB21-1028-02

Tracking

Tracking

Laboratory Project: 21-1168 Collect Date: 10/04/2021 Collect Time:

12:32 PM

Sample Site: Field Sample ID: Lab Sample ID: Matrix:	DEK Bottom Ash Pond DEK-MW-15006 21-1168-04 Groundwater					Laboratory Proje Collect Da Collect Tim
Mercury by EP	A 7470A, Total, Aqueous	i			Aliquot #: 21-	1168-04-C01-A01
Parameter(s)		Result	Flag	Units	RL	Analysis Date
Mercury		ND		ug/L	0.2	10/14/2021
Metals by EPA	6020B: CCR Rule Appen	dix III-IV To	tal Metals	s Exp	Aliquot #: 21-	1168-04-C01-A02
Parameter(s)		Result	Flag	Units	RL	Analysis Date
Antimony		ND		ug/L	1.0	10/28/2021
Arsenic		23		ug/L	1.0	10/28/2021
Barium		125		ug/L	5.0	10/28/2021
Beryllium		ND		ug/L	1.0	10/28/2021
Boron		1050		ug/L	20.0	10/28/2021
Cadmium		ND		ug/L	0.2	10/28/2021
<b>A</b>						

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			liquot #: 21-1	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

21-1168 Page 11 of 18



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



Sulfate

# Sample Site:DEK Bottom Ash PondField Sample ID:DUP-DEK-BAPLab Sample ID:21-1168-05Matrix:Groundwater

Laboratory Project:	21-1168
Collect Date:	10/04/2021
Collect Time:	12:00 PM

	Result	Flog	Unito	RL	Analysia Data	Trockin
arameter(s)		Flag	Units		Analysis Date	Tracking
Mercury	ND		ug/L	0.2	10/14/2021	AB21-1014-0
letals by EPA 6020B: CCR	Rule Appendix III-IV To	tal Metals	s Exp	Aliquot #: 21-1	168-05-C01-A02	Analyst: El
arameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Antimony	ND		ug/L	1.0	10/28/2021	AB21-1028-0
Arsenic	24		ug/L	1.0	10/28/2021	AB21-1028-0
Barium	126		ug/L	5.0	10/28/2021	AB21-1028-0
Beryllium	ND		ug/L	1.0	10/28/2021	AB21-1028-0
Boron	1080		ug/L	20.0	10/28/2021	AB21-1028-0
Cadmium	ND		ug/L	0.2	10/28/2021	AB21-1028-0
Calcium	117000		ug/L	1000.0	10/28/2021	AB21-1028-0
Chromium	ND		ug/L	1.0	10/28/2021	AB21-1028-0
Cobalt	ND		ug/L	6.0	10/28/2021	AB21-1028-0
Copper	ND		ug/L	1.0	10/28/2021	AB21-1028-0
Iron	1430		ug/L	20.0	10/28/2021	AB21-1028-0
Lead	ND		ug/L	1.0	10/28/2021	AB21-1028-0
Lithium	19		ug/L	10.0	10/28/2021	AB21-1028-0
Magnesium	13400		ug/L	1000.0	10/28/2021	AB21-1028-0
Molybdenum	7		ug/L	5.0	10/28/2021	AB21-1028-0
Nickel	11		ug/L	2.0	10/28/2021	AB21-1028-0
Potassium	8190		ug/L	100.0	10/28/2021	AB21-1028-0
Selenium	2		ug/L	1.0	10/28/2021	AB21-1028-0
Silver	ND		ug/L	0.2	10/28/2021	AB21-1028-0
Sodium	109000		ug/L	1000.0	10/28/2021	AB21-1028-0
Thallium	ND		ug/L	2.0	10/28/2021	AB21-1028-0
Vanadium	ND		ug/L	2.0	10/28/2021	AB21-1028-0
Zinc	ND		ug/L	10.0	10/28/2021	AB21-1028-0
nions by EPA 300.0 CCR F	Rule Analyte List, CI, F,	SO4, Aqı	ieous	Aliquot #: 21-1	168-05-C02-A01	Analyst: TM
arameter(s)	Result	Flag	Units	RL	Analysis Date	Trackin
Chloride	74700		ug/L	1000.0	10/12/2021	AB21-1012-0
Fluoride	ND		ug/L	1000.0	10/12/2021	AB21-1012-0

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

ug/L

1000.0

10/12/2021

AB21-1012-05

196000

21-1168 Page 13 of 18



Sample Site:	DEK Bottom Ash Pond	Lab
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 #: 21-1	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

21-1168 Page 14 of 18



Laboratory Project: 21-1168 Collect Date: 10/04/2021 Collect Time: 01:37 PM

Sample Site:	DEK Bottom Ash Pond
Field Sample ID:	FB-DEK-BAP
Lab Sample ID:	21-1168-06
Matrix:	Water

Mercury by EPA 7470A, Total, Aqueous				Aliquot #: 21-1	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 Ap	pendix III-IV To	otal Metals	s Exp	Aliquot #: 21-1	168-06-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

No exceptions occured.

Chemistry Department

General Standard Operating Procedure

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

1

#### TITLE: SAMPLE LOG-IN - SHIPMENT INSPECTION FORM

Proj	ect Log-In Number:21	-1168			
Insp	ection Date: 10.7.21		Inspection By:	dimes	
Sam	ple Origin/Project Name:				
Ship	ment Delivered By: Enter the typ	e of shipment ca	arrier.		
	Pony FedEx	V UF	USPS	Airl	orne
	Other/Hand Carry (whom)				_
	Tracking Number: 284 bo	083 3513	_ Shipping Form Atta	ached: Yes 📝	No
Ship	ping Containers: Enter the type a	and number of sl	ipping containers received.		
	Cooler <u>Cardboa</u>				
	Loose/Unpackaged Containers		Other		
Conc	lition of Shipment: Enter the as-	and the second	the second state of the second second second second second second		
	Damaged Shipment Observed:	None	Dented	Lea	cing
	Other				
Ship	ment Security: Enter if any of the	e shipping contai	ners were opened before rece	eipt.	
	Shipping Containers Received	: Opened	Sealed 🗸		
Encl	osed Documents: Enter the type of				
	CoC V Work Reque			Other	
Temj	perature of Containers: Measure		and the second second second second		
	As-Received Temperature Rar			Ice: Yes N	lo
	M&TE # and Expiration $019$	402 6.3	22		
Num	ber and Type of Containers: En	ter the total num	ber of sample containers rece	eived.	
	Container Type Water	Soil	Other	Broken	Leaking
ett paper	VOA (40mL of 60mL) 10				
fishersei	Quart/Liter (g/p)	<u></u>		$\rightarrow$	0
0.0-3.0	9-oz (amber glass jar)				
t No. 13-640-511	2-oz (amber glass) 125 mL (plastic)				$\rightarrow$
		$\leftrightarrow$			
101=230-110	24 mL vial (glass) 500 mL (plastic)			·	
xp- 10.30.21					
lot: 230418 Exp. 10.30.21	Other 250 ml 5				_

# **CHAIN OF CUSTODY**

**Consumers Energy** 

## **CONSUMERS ENERGY COMPANY – LABORATORY SERVICES**

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

AMPLING SITE: PROJECT NUMBER:		ANALYSIS REQUESTED					Page 1 of 1													
DEK	Botton	a Ash Pond	- 2021 Q4		21-1168										SEND REPORT TO CDBatts					
AMPLI	NG TEA	M:	1.00		DATE SHIPPED: SITE SKETCHED ATTACHED? CIRCLE ONE:		Total Metals			nity				HD Register, TRC PHONE:						
				1			YES	NO	tal N	Anions	S	S	s	SC	S	Alkalinity				
CE	E ROL#	SAMPLE DATE	SAMPLE TIME	SAMPLE MATRIX	SAMPLE DESCRIPTION / LOCA	TION	DEPTH (ft)	# OF CONTAINERS	To	An	TDS	Alb				REMARKS				
21-11	68-01	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			1					
	-03	10-4-21	1139	GW	DEK-MW-15005			5	x	x	x	x								
	-04	10-4-21	1232	GW	DEK-MW-15006		i	5	x	x	x	x								
	-05	10-4-21	-	W	DUP-DEK-BAP		1	5	x	x	x	x			1					
+	-06	10-4-21	1337	W	FB-DEK-BAP			1	x											
			1.1.1.1												1					
							1													
			1																	
							1													
		-				-			1											
									1											
ELINQ	UISHEL	BY: (SIGNA	TURE)	DATE/T	IME .6-21 /1619 RECE		: (SIGNATUR dex	E)					C	OMMEN	TS					
RELINQUISHED BY: (SIGNATURE) DATE/T			ME: RECE 07-21 11:30		: (SIGNATUR	E)			0		TOLA		DV TO	CUSTOMER						
	_	Fe	ed ex	10-	07-21 11:30	- (J-1	168 Page 18	of 18			OI	RIGINA	TO LAI	в со	PY 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

135 W. Trail St.

Jackson, MI 49201

#### Chemistry Project: 21-1169

*phone* 517-788-1251 *fax* 517-788-2533

TRC Environmental, Inc. conducted groundwater monitoring at the DEKarn Bottom Ash Pond and Lined Impoundment Wells area on 10/07/2021, for the 4<sup>th</sup> 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 accredidation 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, 22<sup>nd</sup> Edition, 2012.

#### III. <u>Results/Quality Control</u>

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:

Acronym	Description
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>	Description
*	Generic data flag, applicable description added in the corresponding notes section
В	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
Н	The maximum recommended hold time was exceeded
Ι	Dilution required due to matrix interference; reporting limit elevated
J	Estimated due to result found above MDL but below PQL (or RL)
Κ	Reporting limit raised due to matrix interference
Μ	The precision for duplicate analysis was not met; RPD outside acceptance criteria
Ν	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
Х	Other notation required; comment listed in sample notes and/or case narrative



# Customer Name:Karn/Weadock ComplexWork Order ID:Q4-2021 DEK RCRA Bottom Ash Pond & Lined ImpoundmentDate Received:10/7/2021Chemistry Project:21-1169

<u>Sample #</u>	Field Sample ID	Matrix	Sample Date	<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



**Total Dissolved Solids** 

AB21-1011-04

10/11/2021

10.0

Sample Site:	DEK Bottom Ash Pond & Lined Impoundment	Laboratory Project:	21-1169
Field Sample ID:	DEK-MW-15003	Collect Date:	10/07/2021
Lab Sample ID:	21-1169-01	Collect Time:	07:27 AM
Matrix:	Groundwater		

Mercury by EPA 7470A, Total, Aqueo					169-01-C01-A01	Analyst: CLF
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 App	pendix III-IV To	otal Metals	s Exp	Aliquot #: 21-1	169-01-C01-A02	Analyst: EE
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 Anal	lyte List, CI, F,	SO4, Aqu	ieous	Aliquot #: 21-1	169-01-C02-A01	Analyst: DMW
Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking
Chloride	54000	2	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				Aliguot #: 21-1	169-01-C03-A01	Analyst: CLF
Parameter(s)	Result	Flag	Units	RL	Analysis Date	Tracking

mg/L

253



Sample Site:	DEK Bottom Ash Pond & Lined Impoundment	Laboratory Project:	21-1169
Field Sample ID:	DEK-MW-15003	Collect Date:	10/07/2021
Lab Sample ID:	21-1169-01	Collect Time:	07:27 AM
Matrix:	Groundwater		

Alkalinity by SM 2320B			Aliquot #: 21-1	169-01-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



**Total Dissolved Solids** 

10/11/2021

10.0

AB21-1011-04

Sample Site:	DEK Bottom Ash Pond & Lined Impoundment	Laboratory Project:	21-1169
Field Sample ID:	DEK-MW-18001	Collect Date:	10/07/2021
Lab Sample ID:	21-1169-02	Collect Time:	06:32 AM
Matrix:	Groundwater		

Mercury by EPA 7470A, Total, Aqueou	S			Aliquot #: 21-1	169-02-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 Appe	ndix III-IV To	tal Metal	s Exp	Aliquot #: 21-1	169-02-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 Analyt	e List, Cl, F,	SO4, Aqı	leous	Aliquot #: 21-1	169-02-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 #: 21-1	169-02-C03-A01	Analyst: CLH
Parameter(s)	Result	Flag	Units		Analysis Date	Tracking
	40.4	9			40/44/0004	

mg/L

494



Sample Site:	DEK Bottom Ash Pond & Lined Impoundment	Laboratory Project:	21-1169
Field Sample ID:	DEK-MW-18001	Collect Date:	10/07/2021
Lab Sample ID:	21-1169-02	Collect Time:	06:32 AM
Matrix:	Groundwater		

Alkalinity by SM 2320B		Aliquot #: 21-1	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



Sample Site:	DEK Bottom Ash Pond & Lined Impoundment	Laboratory Project:	21-1169
Field Sample ID:	DEK-MW-18001 MS	Collect Date:	10/07/2021
Lab Sample ID:	21-1169-03	Collect Time:	06:32 AM
Matrix:	Groundwater		

Mercury by EPA 7470A, Total,	Aqueous			Aliquot #: 21-1	169-03-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 R	ule Appendix III-IV To	otal Metals	а Ехр	Aliquot #: 21-1	169-03-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, CI, F,	Aliquot #: 21-1	169-03-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 #: 21-1	169-03-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	



Sample Site:	DEK Bottom Ash Pond & Lined Impoundment	Laboratory Project:	21-1169
Field Sample ID:	DEK-MW-18001 MSD	Collect Date:	10/07/2021
Lab Sample ID:	21-1169-04	Collect Time:	06:32 AM
Matrix:	Groundwater		

Mercury by EPA 7470A, Total, Aqueous				Aliquot #: 21-1	169-04-C01-A01	01 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 To	tal Metals	Ехр	Aliquot #: 21-1	169-04-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	Aliquot #: 21-1	169-04-C02-A01	01 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 #: 21-1	169-04-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



Data Qualifiers

Exception Summary

No exceptions occured.

Chemistry Department

General Standard Operating Procedure

[

#### TITLE: SAMPLE LOG-IN – SHIPMENT INSPECTION FORM

Project Log-In Number:						
Inspection Date: 10 9 2	-		Inspection B	y: <u>U</u> H		
Sample Origin/Project Name:	Dek	BAP+	17			
Shipment Delivered By: Enter	-					
Pony Fe Other Hand Carry (who	dEx	UPS_		USPS	Airbo	rne
Other Hand Carry (who	m) <u>74</u> C					
Tracking Number			Shıppin	g Form Attache	d. Yes	No
Shipping Containers: Enter the	e type and num	ber of shipp	ing containers	received		
Cooler <u> </u>	ardboard Box _		Custom C	ase	Envelope/	Mailer
Loose/Unpackaged Con						
Condition of Shipment: Enter t	the as-received	l condition o	f the shipmen	t container		
Damaged Shipment Obs		,	-	ted	Leaki	ng
Other						-8
Shipment Security: Enter if any Shipping Containers Re		ng container:				
Shipping Containers Re	ceived Open	ed	Seal	ed		
Enclosed Documents: Enter the	• •			-		
CoC V Work	Request		Aır Data Sl	neet	Other	
Temperature of Containers: M	easure the tem	perature of s	several sample	e containers		
As-Received Temperatu	ire Range 2.L	1.5.32	Samples R	eceived on Ice.	Yes 🖉 No	
M&TE # and Expiration			<u>1</u>		<u> </u>	
	1					
Number and Type of Container	rs: Enter the t	otal number	of sample cor	ntainers received	ł	
		<u>Soil</u>	Othe	<u>r</u>	<u>Broken</u>	<u>Leaking</u>
VOA (40mL or $60$ mL $_{-}$	8				·	. <u> </u>
Quart/Liter (g/p)	·		······			·
9-oz (amber glass jar)						
2-oz (amber glass)	8	·				
( (		·		<del></del>	··-	
24 mL vial (glass)	2	<u>.                                    </u>			·	······································
Other	·	·			<u> </u>	

## 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

**Consumers Energy** 

SAMPLING SIT	<u> </u>			PROJECT NUMBER			ANALYSIS REQUESTED						Page 1 of 1					
DEK Botto	m Ash Pond	l & LI – 202	1 Q4	21	-1169												SEND REPORT TO CDBatts	
SAMPLING TE	AM	·		DATE SHIPPED	SIT	TE SKETCHEI CIRCLE	O ATTACHED?	als										HD Register, TRC
						YES	NO	Total Metals	su		Alkalınity					PHONE		
CE CONTROL #	SAMPLE DATE	SAMPLE TIME	SAMPLE MATRIX	SAMPLE DESCRIPTION / LOCA	TION	DEPTH (ft)	# OF CONTAINERS	Tota	Anions	TDS	Alka					REMARKS		
21-1169-01	10/7/31	0787	GW	DEK-MW-15003			5	x	x	x	x							
-02	ar	6633	GW	DEK-MW-18001			5	x	x	x	x							
-03	611	Olers	GW	DEK-MW-18001 MS			5	x	x		x							
<b>↓</b> -04	1011	der	GW	DEK-MW-18001 MSD	_		5	x	x		x							
															1			
RELINQUISHE	ELINQUISHED BY (SIGNATURE) DATE/TIME RECEIVED BY (SIGNATURE)		E)						COM	IMENT	S							
	10/7/31 (570)		2	L-4°		5.3 402	° C											
RELINQUISHE	D BY (SIGNA	TURE)	DATE/TI		IVED B	(SIGNATUR	 (E)	1	ž	K 012	70%	•						
					•					0	RIGIN	AL TO	LAB	COP	Y TO	CUSTOMER		

# 🔅 eurofins

## Environment Testing America

## **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

Brooks

Authorized for release by: 11/19/2021 8:10:30 PM

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

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

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

3

5

# Qualifiers

R	а	d	
	a	u	

Rad	
Qualifier	Qualifier Description
*	LCS or LCSD is outside acceptance limits.
U	Result is less than the sample detection limit.

### Glossary

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

### 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

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

Collected

10/07/21 09:08 10/09/21 10:10

10/06/21 16:02 10/09/21 10:10

10/07/21 10:10 10/09/21 10:10

10/07/21 08:10 10/09/21 10:10

10/07/21 00:00 10/09/21 10:10

10/07/21 10:10 10/09/21 10:10

Received

Matrix

Water

Water

Water

Water

Water

Water

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

**Client Sample ID** 

MW-15002

MW-15008

MW-15016

MW-15019

DUP-04

EB-04

Lab Sample ID

240-157750-1

240-157750-2

240-157750-3

240-157750-4

240-157750-5

240-157750-6

Job ID: 240-157750-1

5
6
8
9

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

Job ID: 240-157750-1

Lab Sample ID: 240-157750-1 Matrix: Water

#### Client Sample ID: MW-15002 Date Collected: 10/07/21 09:08 Date Received: 10/09/21 10:10

			Count Uncert.	Total Uncert.						
Analyte	Result	Qualifier	(2σ+/-)	(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
-			40 - 110					10/10/21 11:10	11/00/21 11.23	
Method: 904.0 -	Radium-228	(GFPC)								
			Count	Total						

#### Uncert. Uncert. **Result Qualifier** (2**σ**+/-) Analyte (2**σ**+/-) RL MDC Unit Prepared Analyzed Dil Fac Radium-228 0.225 U 0.347 0.347 0.582 pCi/L 10/15/21 11:44 11/08/21 13:12 1.00 1 %Yield Qualifier Carrier Limits Prepared Analyzed Dil Fac Ba Carrier 96.1 40 - 110 10/15/21 11:44 11/08/21 13:12 1 81.5 40 - 110 10/15/21 11:44 11/08/21 13:12 Y Carrier 1

#### Method: Ra226\_Ra228 - Combined Radium-226 and Radium-228

			Count	Total						
			Uncert.	Uncert.						
Analyte	Result	Qualifier	(2σ+/-)	(2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium	1.00		0.501	0.505	5.00	0.582	pCi/L		11/18/21 22:40	1
226 + 228										

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

Job ID: 240-157750-1

Lab Sample ID: 240-157750-2 Matrix: Water

Client Sample ID: MW-15008 Date Collected: 10/06/21 16:02 Date Received: 10/09/21 10:10

			Count Uncert.	Total Uncert.						
Analyte	Result	Qualifier	(2σ+/-)	(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
								10/15/01 11 10	44/00/04 47:00	
Ba Carrier Method: 904.0 - I	102 Radium-228	(GFPC)	40 - 110 Count Uncert.	Total Uncert.				10/15/21 11:10	11/08/21 17:29	1
		(GFPC)		Total				10/15/21 11:10	11/08/21 17:29	1
	Radium-228	(GFPC) Qualifier	Count		RL	MDC	Unit	Prepared	Analyzed	ז Dil Fac
Method: 904.0 - I	Radium-228	Qualifier	Count Uncert.	Uncert.	<b>RL</b> 1.00	<b>MDC</b> 0.493				7 Dil Fac
Method: 904.0 - I Analyte	Radium-228	Qualifier	Count Uncert. (2σ+/-)	Uncert. (2σ+/-)				Prepared	Analyzed	Dil Fac
Method: 904.0 - I Analyte Radium-228	Radium-228	Qualifier *	Count Uncert. (2σ+/-) 0.371	Uncert. (2σ+/-)				Prepared 10/15/21 11:44	Analyzed 11/08/21 13:12	1

			Uncert.	Uncert.							
Analyte	Result Q	ualifier	(2 <b>σ</b> +/-)	(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: TRC Environmental Corporation. Project/Site: Karn/Weadock CCR Background Wells

**Client Sample ID: MW-15016** 

Date Collected: 10/07/21 10:10

Date Received: 10/09/21 10:10

Job ID: 240-157750-1

Lab Sample ID: 240-157750-3 Matrix: Water 5

7

			Count Uncert.	Total Uncert.						
Analyte	Result	Qualifier	(2σ+/-)	(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			40 - 110					10/15/21 11:10	11/08/21 17:29	1
Method: 904.0 -	Radium-228	(GFPC)	Count	Total						
		. ,	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RI	MDC	Unit	Prenared	<b>Analyzed</b>	Dil Fac
Method: 904.0 - Analyte Radium-228		Qualifier			<b>RL</b> 1.00	<b>MDC</b> 0.478		Prepared 10/15/21 11:44	Analyzed 11/08/21 13:12	Dil Fac
Analyte	Result	Qualifier	Uncert. (2σ+/-)	Uncert. (2σ+/-)						Dil Fac 1 Dil Fac
Analyte Radium-228	Result	Qualifier U	Uncert. (2σ+/-) 0.304	Uncert. (2σ+/-)				10/15/21 11:44	11/08/21 13:12	1

#### Method: Ra226\_Ra228 - Combined Radium-226 and Radium-228

			Count	Total						
			Uncert.	Uncert.						
Analyte	Result	Qualifier	(2σ+/-)	(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: TRC Environmental Corporation. Project/Site: Karn/Weadock CCR Background Wells

Client Sample ID: MW-15019

Date Collected: 10/07/21 08:10

Date Received: 10/09/21 10:10

Job ID: 240-157750-1

2 Lab Sample ID: 240-157750-4 Matrix: Water 4 5

7

			Count Uncert.	Total Uncert.						
Analyte	Result	Qualifier	(2σ+/-)	(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
								10/15/01 11 10	44/00/04 47:00	
Ba Carrier Method: 904.0 -	101 Radium-228	(GFPC)	40 - 110 Count	Total				10/15/21 11:10	11/08/21 17:32	1
-		(GFPC)	Count					10/15/21 11:10	11/08/21 17:32	1
-	Radium-228	(GFPC) Qualifier		Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Method: 904.0 -	Radium-228	Qualifier	Count Uncert.	Uncert.	<b>RL</b> 1.00		Unit pCi/L			Dil Fac
Method: 904.0 -	Radium-228	Qualifier	Count Uncert. (2σ+/-)	Uncert. (2σ+/-)				Prepared	Analyzed	Dil Fac
Method: 904.0 - Analyte Radium-228	Radium-228	Qualifier U	Count Uncert. (2σ+/-) 0.267	Uncert. (2σ+/-)				Prepared 10/15/21 11:44	Analyzed 11/08/21 13:13	1

			Count	Total							ŝ
			Uncert.	Uncert.							
Analyte	Result	Qualifier	(2σ+/-)	(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: TRC Environmental Corporation. Project/Site: Karn/Weadock CCR Background Wells

Lab Sample ID: 240-157750-5 Matrix: Water

5

7

#### Client Sample ID: DUP-04 Date Collected: 10/07/21 00:00 Date Received: 10/09/21 10:10

			Count Uncert.	Total Uncert.						
Analyte	Result	Qualifier	(2σ+/-)	(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 -		(GFPC)								
Method: 904.0 -		(GFPC)	Count Uncert.	Total Uncert.						
	Radium-228	(GFPC) Qualifier	Count		RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Method: 904.0 - Analyte Radium-228	Radium-228	Qualifier	Count Uncert.	Uncert.	<b>RL</b> 1.00		Unit pCi/L		Analyzed 11/08/21 13:15	Dil Fac
Analyte	Radium-228	Qualifier	Count Uncert. (2σ+/-)	Uncert. (2σ+/-)				Prepared		Dil Fac 1 Dil Fac
Analyte Radium-228	Radium-228	Qualifier	Count Uncert. (2σ+/-) 0.221	Uncert. (2σ+/-)				Prepared 10/15/21 11:44	11/08/21 13:15	1

#### Method: Ra226\_Ra228 - Combined Radium-226 and Radium-228

			Count	Total							î
			Uncert.	Uncert.							
Analyte	Result	Qualifier	(2σ+/-)	(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: TRC Environmental Corporation. Project/Site: Karn/Weadock CCR Background Wells

Lab Sample ID: 240-157750-6 Matrix: Water

#### **Client Sample ID: EB-04** Date Collected: 10/07/21 10:10 Date Received: 10/09/21 10:10

			Count Uncert.	Total Uncert.						
Analyte	Result	Qualifier	(2σ+/-)	(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 -		(GFPC)	Count	Total				10,10,21 11.10	11100/21 11:02	,
-		(GFPC)		Total Uncert.				10,10,21 11.10	11100/21 11:02	,
Method: 904.0 - Analyte	Radium-228	Qualifier	Count Uncert. (2σ+/-)	Uncert. (2σ+/-)	<b>RL</b>	MDC	Unit	Prepared	Analyzed	Dil Fac
Method: 904.0 - Analyte	Radium-228	Qualifier	Count Uncert.	Uncert.	<b>RL</b> 1.00	<b>MDC</b> 0.327	Unit pCi/L			Dil Fac
Method: 904.0 - Analyte Radium-228	Radium-228	Qualifier	Count Uncert. (2σ+/-)	Uncert. (2σ+/-)				Prepared	Analyzed	Dil Fac 1 Dil Fac
Method: 904.0 -	Radium-228	Qualifier *	Count Uncert. (2σ+/-) 0.247	Uncert. (2σ+/-)				Prepared 10/15/21 11:44	Analyzed 11/08/21 13:15	1

#### Total Count Uncert. Uncert. MDC Unit Prepared Analyzed Analyte **Result Qualifier** (2**σ**+/-) (2**σ**+/-) RL **Combined Radium** 0.406 0.415 5.00 0.408 pCi/L 11/18/21 22:40 1.31

226 + 228

Dil Fac

1

5

# **Tracer/Carrier Summary**

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

#### Method: 903.0 - Radium-226 (GFPC) Matrix: Water

			Percent Yield (Acceptance Limits)	
		Ва		
Lab Sample ID	Client Sample ID	(40-110)		5
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		8
LCS 160-531995/1-A	Lab Control Sample	96.4		U
LCSD 160-531995/2-A	Lab Control Sample Dup	90.4		0
MB 160-531995/20-A	Method Blank	82.4		3
Tracer/Carrier Legend	I			

Ba = Ba Carrier

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

Matrix: Water

				Percent Yield (Acceptance Limits)
		Ва	Y	
Lab Sample ID	Client Sample ID	(40-110)	(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

Prep Type: Total/NA

# **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)

ab Sample II		60-5319	95/20-A						Clie		le ID: Met		
Matrix: Water		20									Prep Type		
Analysis Bato	cn: 5362	30		Count	Total						Prep Bate	cn: 5	2199
		МВ	MR	Uncert.	Uncert.								
Analyte			Qualifier	(2σ+/-)	(2σ+/-)	RL	MDC	Unit		repared	Analyze	ч	Dil Fa
Radium-226		-0.04114		0.120	0.120	1.00	0.258			15/21 11:10	11/12/21 10		DIFA
Caulum-220		-0.04114	0	0.120	0.120	1.00	0.250	poi/L	10/	13/21 11.10	11/12/21 10	).22	
		MB	МВ										
Carrier			Qualifier	Limits						Prepared	Analyze		Dil Fa
Ba Carrier		82.4		40 - 110					10/1	15/21 11:10	11/12/21 10	):22	
.ab Sample II	D: LCS	160-531	995/1-A					Cli	ent Sa	mple ID:	Lab Conti	rol Sa	ampl
Aatrix: Water											Prep Type		
Analysis Bato	ch: 5353	97									<b>Prep Bate</b>	ch: 5	31 <mark>99</mark>
-						Total					-		
			Spike	LCS	LCS	Uncert.					%Rec.		
Analyte			Added	Result	Qual	(2σ+/-)	RL	MDC	Unit	%Rec	Limits		
Radium-226			15.1	14.43		1.84	1.00	0.468	pCi/L	95	75 - 125		
		LCS											
	LCS	200											
Carrier		Qualifier	Limits	_									
			Limits 40 - 110	-									
Ba Carrier	% <b>Yield</b> 96.4	Qualifier	40 - 110	-				Client S	ample	ID: Lab (	Control Sa	ample	e Du
Carrier Ba Carrier Lab Sample II Matrix: Water	%Yield 96.4 D: LCSE	Qualifier	40 - 110	-				Client S	ample		Control Sa Prep Type		
Ba Carrier	%Yield 96.4 D: LCSE	Qualifier	40 - 110	-				Client S	ample		Control Sa Prep Type Prep Bate	e: Tot	tal/N
<sup>Ba Carrier</sup> ∟ab Sample II Matrix: Water	%Yield 96.4 D: LCSE	Qualifier	40 - 110	-		Total		Client S	ample		Prep Type	e: Tot	tal/N
<sup>Ba Carrier</sup> ∟ab Sample II Matrix: Water	%Yield 96.4 D: LCSE	Qualifier	40 - 110	LCSD	LCSD	Total Uncert.		Client S	ample		Prep Type	e: Tot	tal/N/ 3199
Ba Carrier Lab Sample II Matrix: Water Analysis Bate	%Yield 96.4 D: LCSE	Qualifier	40 - 110 3 <b>1995/2-A</b>	LCSD Result			RL	Client S MDC			Prep Type Prep Bate	e: Tot	tal/N 3199 RE
a Carrier Lab Sample II Matrix: Water Analysis Batc	%Yield 96.4 D: LCSE	Qualifier	40 - 110 81995/2-A Spike			Uncert.			Unit		Prep Type Prep Bate %Rec.	e: Tot ch: 5	tal/N 3199 RE Lim
<sup>Ba Carrier</sup> ∟ab Sample II Matrix: Water	%Yield 96.4 D: LCSE ch: 5353	Qualifier 0 160-53 97	40 - 110 81995/2-A Spike Added	Result		Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	Prep Type Prep Bate %Rec. Limits	e: Tot ch: 5 <u>RER</u>	tal/N
a Carrier Lab Sample II Matrix: Water Analysis Batc Analyte Radium-226	%Yield 96.4 D: LCSE ch: 5353	Qualifier 0 160-53 97 	40 - 110 <b>31995/2-A</b> Spike Added 15.1	Result		Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	Prep Type Prep Bate %Rec. Limits	e: Tot ch: 5 <u>RER</u>	tal/N 3199 RE Lim
a Carrier Lab Sample II Matrix: Water Analysis Batc	%Yield 96.4 D: LCSE ch: 5353	Qualifier 0 160-53 97	40 - 110 <b>31995/2-A</b> Spike Added 15.1	Result 12.63		Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	Prep Type Prep Bate %Rec. Limits	e: Tot ch: 5 <u>RER</u>	tal/N 3199 RE Lim
a Carrier Lab Sample II Matrix: Water Analysis Bato Malyte Radium-226 Carrier Ba Carrier	%Yield 96.4 D: LCSE ch: 5353 LCSD %Yield 90.4	Qualifier 0 160-53 97 LCSD Qualifier	40 - 110 <b>51995/2-A</b> <b>Spike</b> Added 15.1 Limits 40 - 110	Result 12.63		Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	Prep Type Prep Bate %Rec. Limits	e: Tot ch: 5 <u>RER</u>	tal/N 3199 RE Lim
Ba Carrier Lab Sample II Matrix: Water Analysis Bato Analyte Radium-226 Carrier Ba Carrier	%Yield 96.4 D: LCSE ch: 5353 LCSD %Yield 90.4	Qualifier 0 160-53 97 LCSD Qualifier	40 - 110 <b>51995/2-A</b> <b>Spike</b> Added 15.1 Limits 40 - 110	Result 12.63		Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	Prep Type Prep Bate %Rec. Limits	e: Tot ch: 5 <u>RER</u>	tal/N 3199 RE Lim
Analysis Batco Analysis Batco Analysis Batco Analyte Radium-226 Carrier Ba Carrier ethod: 904	%Yield 96.4 D: LCSE ch: 5353 <i>LCSD</i> %Yield 90.4	Qualifier 0 160-53 97 LCSD Qualifier dium-2	40 - 110 <b>51995/2-A</b> Spike Added 15.1 Limits 40 - 110 <b>228 (GFPC</b>	Result 12.63		Uncert. (2σ+/-)	RL	MDC	Unit pCi/L	<u>%Rec</u> 84	Prep Type Prep Bate %Rec. Limits	e: Tot ch: 53 <u>RER</u> 0.51	tal/N. 3199 RE Lim
Ba Carrier Lab Sample II Matrix: Water Analysis Bato Analyte Radium-226 Carrier	%Yield 96.4 D: LCSE ch: 5353 <i>LCSD</i> %Yield 90.4 L.0 - Ra D: MB 1	Qualifier 0 160-53 97 LCSD Qualifier dium-2	40 - 110 <b>51995/2-A</b> Spike Added 15.1 Limits 40 - 110 <b>228 (GFPC</b>	Result 12.63		Uncert. (2σ+/-)	RL	MDC	Unit pCi/L	- <u>%Rec</u> 84 -	Prep Type Prep Bate %Rec. Limits 75 - 125	e: Tot ch: 53 RER 0.51	tal/N/ 3199 RE Lim
Analyte Radium-226 Carrier Ba Carrier Ba Carrier Ba Carrier ethod: 904 Lab Sample II	%Yield 96.4 D: LCSD ch: 5353 <i>LCSD</i> %Yield 90.4 L.0 - Ra D: MB 1	Qualifier 0 160-53 97 <i>LCSD</i> <i>Qualifier</i> dium-2 60-5319	40 - 110 <b>51995/2-A</b> Spike Added 15.1 Limits 40 - 110 <b>228 (GFPC</b>	Result 12.63		Uncert. (2σ+/-)	RL	MDC	Unit pCi/L	- <u>%Rec</u> 84 -	Prep Type Prep Bate %Rec. Limits 75 - 125	RER 0.51	tal/N/ 3199 RE Lim Blan tal/N/
Analyte Radium-226 Carrier Ba Carrier Ba Carrier Ba Carrier ethod: 904 Lab Sample II Matrix: Water	%Yield 96.4 D: LCSD ch: 5353 <i>LCSD</i> %Yield 90.4 L.0 - Ra D: MB 1	Qualifier 0 160-53 97 <i>LCSD</i> <i>Qualifier</i> dium-2 60-5319	40 - 110 <b>51995/2-A</b> Spike Added 15.1 Limits 40 - 110 <b>228 (GFPC</b>	Result 12.63		Uncert. (2σ+/-)	RL	MDC	Unit pCi/L	- <u>%Rec</u> 84 -	Prep Type Prep Bate %Rec. Limits 75-125	RER 0.51	tal/N/ 3199 RE Lim Blan tal/N/
Analyte Radium-226 Carrier Ba Carrier Ba Carrier Ba Carrier ethod: 904 Lab Sample II Matrix: Water	%Yield 96.4 D: LCSD ch: 5353 <i>LCSD</i> %Yield 90.4 L.0 - Ra D: MB 1	Qualifier 0 160-53 97 <i>LCSD</i> <i>Qualifier</i> dium-2 60-5319	40 - 110 31995/2-A Spike Added 15.1 Limits 40 - 110 228 (GFPC 98/20-A	Result 12.63	Qual	Uncert. (2σ+/-)	RL	MDC	Unit pCi/L	- <u>%Rec</u> 84 -	Prep Type Prep Bate %Rec. Limits 75-125	RER 0.51	tal/NJ 3199 RE Lim Blan tal/NJ
Analyte Radium-226 Carrier Ba Carrier Ba Carrier Ba Carrier ethod: 904 Lab Sample II Matrix: Water	%Yield 96.4 D: LCSD ch: 5353 <i>LCSD</i> %Yield 90.4 L.0 - Ra D: MB 1	Qualifier 0 160-53 97 <i>LCSD</i> <i>Qualifier</i> dium-2 60-5319 05 MB	40 - 110 31995/2-A Spike Added 15.1 Limits 40 - 110 228 (GFPC 98/20-A	Result 12.63	Qual	Uncert. (2σ+/-)	RL	<u>MDC</u> 0.582	Unit pCi/L	- <u>%Rec</u> 84 -	Prep Type Prep Bate %Rec. Limits 75-125	e: Tot ch: 53 RER 0.51	tal/N/ 3199 RE Lim Blan tal/N/

	MB	МВ				
Carrier	%Yield	Qualifier L	imits	Prepared	Analyzed	Dil Fac
Ba Carrier	82.4	4	0 - 110	10/15/21 11:44	11/08/21 13:16	1
Y Carrier	89.0	4	0 - 110	10/15/21 11:44	11/08/21 13:16	1

Eurofins TestAmerica, Canton

Job ID: 240-157750-1

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

Lab Sample Matrix: Wat	ter		8/1-A					Clie	ent San	nple ID:	Lab Cont Prep Typ	e: Tota	al/NA	
Analysis Ba	atch: 5353	193				Total					Prep Bat	tch: 53	1998	
			Spike	LCS	LCS	Uncert.					%Rec.			2
Analyte			Added	Result		(2 <b>σ</b> +/-)	RL	MDC	Unit	%Rec	Limits			
Radium-228			12.2	15.51		1.85	1.00	0.733	pCi/L	127	75 - 125			
	LCS	LCS												
Carrier		Qualifier	Limits											
Ba Carrier	96.4		40 - 110											
Y Carrier	60.2		40 - 110											
													_	
Lab Sample	e ID: LCSE	) 160-5319					c	Client Sa	ample	ID: Lab	Control S			
Lab Sample Matrix: Wat	e ID: LCSE ter						(	Client Sa	ample	ID: Lab	Prep Typ	e: Tota	al/NA	
Lab Sample	e ID: LCSE ter					Total	(	Client S	ample	ID: Lab		e: Tota	al/NA	
Lab Sample Matrix: Wat	e ID: LCSE ter		98/2-A	LCSD	LCSD	Total	(	Client S	ample	ID: Lab	Prep Typ Prep Bat	e: Tota	al/NA 31998	
Lab Sample Matrix: Wat Analysis Ba	e ID: LCSE ter		998/2-A Spike	LCSD Result		Uncert.					Prep Typ Prep Bat %Rec.	e: Tota tch: 53	al/NA 31998 RER	
Lab Sample Matrix: Wat	e ID: LCSE ter		98/2-A	LCSD Result 13.75			<b>RL</b> 1.00	MDC	unit	ID: Lab	Prep Typ Prep Bat	e: Tota	al/NA 31998	
Lab Sample Matrix: Wat Analysis Ba Analyte	e ID: LCSE ter atch: 5353	393	998/2-A Spike Added	Result		Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	Prep Typ Prep Bat %Rec. Limits	e: Tota tch: 53	al/NA 1998 RER Limit	
Lab Sample Matrix: Wat Analysis Ba Analyte Radium-228	e ID: LCSE ter atch: 5353 	393 	998/2-A Spike Added 12.2	Result		Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	Prep Typ Prep Bat %Rec. Limits	e: Tota tch: 53	al/NA 1998 RER Limit	
Lab Sample Matrix: Wat Analysis Ba Analyte	e ID: LCSE ter atch: 5353 	393	998/2-A Spike Added	Result		Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	Prep Typ Prep Bat %Rec. Limits	e: Tota tch: 53	al/NA 1998 RER Limit	

# **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	Ргер Туре	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	
_CS 160-531995/1-A	Lab Control Sample	Total/NA	Water	PrecSep STD	
-CSD 160-531995/2-A	Lab Control Sample Dup	Total/NA	Water	PrecSep STD	
rep Batch: 531998					
_ab Sample ID	Client Sample ID	Ргер Туре	Matrix	Method	Prep Batch
- <b>ab Sample ID</b> 240-157750-1	Client Sample ID MW-15002	Prep Type Total/NA	Matrix Water	Method PrecSep_0	Prep Batch
-ab Sample ID 240-157750-1	•				Prep Batch
Lab Sample ID 240-157750-1 240-157750-2	MW-15002	Total/NA	Water	PrecSep_0	Prep Batch
Lab Sample ID 240-157750-1 240-157750-2 240-157750-3	MW-15002 MW-15008	Total/NA Total/NA	Water Water	PrecSep_0 PrecSep_0	Prep Batch
Lab Sample ID 240-157750-1 240-157750-2 240-157750-3 240-157750-4	MW-15002 MW-15008 MW-15016	Total/NA Total/NA Total/NA	Water Water Water	PrecSep_0 PrecSep_0 PrecSep_0 PrecSep_0	Prep Batch
<b>Lab Sample ID</b> 240-157750-1 240-157750-2 240-157750-3 240-157750-4 240-157750-5	MW-15002 MW-15008 MW-15016 MW-15019	Total/NA Total/NA Total/NA Total/NA	Water Water Water Water	PrecSep_0 PrecSep_0 PrecSep_0 PrecSep_0 PrecSep_0	Prep Batch
Lab Sample ID           240-157750-1           240-157750-2           240-157750-3           240-157750-4           240-157750-5           240-157750-6	MW-15002 MW-15008 MW-15016 MW-15019 DUP-04	Total/NA Total/NA Total/NA Total/NA Total/NA	Water Water Water Water Water Water	PrecSep_0 PrecSep_0 PrecSep_0 PrecSep_0 PrecSep_0 PrecSep_0	Prep Batch
rep Batch: 531998           Lab Sample ID           240-157750-1           240-157750-2           240-157750-3           240-157750-4           240-157750-5           240-157750-6           MB 160-531998/20-A           LCS 160-531998/1-A	MW-15002 MW-15008 MW-15016 MW-15019 DUP-04 EB-04	Total/NA Total/NA Total/NA Total/NA Total/NA Total/NA	Water Water Water Water Water Water Water	PrecSep_0 PrecSep_0 PrecSep_0 PrecSep_0 PrecSep_0 PrecSep_0 PrecSep_0	Prep Batch

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

Job ID: 240-157750-1

Matrix: Water

**Matrix: Water** 

Matrix: Water

Lab Sample ID: 240-157750-1

Lab Sample ID: 240-157750-2

Lab Sample ID: 240-157750-3

# 2 3 4 5 6 7 8 9 10 11

#### Client Sample ID: MW-15002 Date Collected: 10/07/21 09:08 Date Received: 10/09/21 10:10

	Batch	Batch		Dilution	Batch	Prepared		
Prep Туре	Туре	Method	Run	Factor	Number	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 Date Collected: 10/06/21 16:02 Date Received: 10/09/21 10:10

_	Batch	Batch		Dilution	Batch	Prepared		
Prep Type	Туре	Method	Run	Factor	Number	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 Date Collected: 10/07/21 10:10 Date Received: 10/09/21 10:10

	Batch	Batch		Dilution	Batch	Prepared		
Prep Type	Туре	Method	Run	Factor	Number	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 Date Collected: 10/07/21 08:10 Date Received: 10/09/21 10:10

#### Lab Sample ID: 240-157750-4 Matrix: Water

Batch Batch Dilution Batch Prepared Method Number or Analyzed Analyst Prep Type Туре Run Factor Lab Total/NA Prep PrecSep STD 531995 10/15/21 11:10 BMP TAL SL Total/NA Analysis 903.0 535393 11/08/21 17:32 FLC TAL SL 1 Total/NA 531998 10/15/21 11:44 BMP TAL SL Prep PrecSep\_0 Total/NA Analysis 904.0 1 535390 11/08/21 13:13 JLP TAL SL Total/NA Analysis Ra226 Ra228 537496 11/18/21 22:40 EMH TAL SL 1

#### Client Sample ID: DUP-04 Date Collected: 10/07/21 00:00 Date Received: 10/09/21 10:10

	Batch	Batch		Dilution	Batch	Prepared		
Ргер Туре	Туре	Method	Run	Factor	Number	or Analyzed	Analyst	Lab
otal/NA	Prep	PrecSep STD			531995	10/15/21 11:10	BMP	TAL SL
īotal/NA	Analysis	903.0		1	535393	11/08/21 17:32	FLC	TAL SL
otal/NA	Prep	PrecSep_0			531998	10/15/21 11:44	BMP	TAL SL
īotal/NA	Analysis	904.0		1	535405	11/08/21 13:15	FLC	TAL SL
īotal/NA	Analysis	Ra226_Ra228		1	537496	11/18/21 22:40	EMH	TAL SL
<sup>Total/NA</sup>	,	_		1	537496	11/18/21 22:40	<sub>ЕМН</sub>	

#### Client Sample ID: EB-04 Date Collected: 10/07/21 10:10 Date Received: 10/09/21 10:10

_	Batch	Batch		Dilution	Batch	Prepared		
Prep Type	Туре	Method	Run	Factor	Number	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

Matrix: Water

# 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
lowa	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.

Eurofins TestAmerica, Canton	4101 Shuffel Street NW	Vorth Canton, OH 44720
<b>Eurofins TestAmeric</b>	4101 Shuffel Street NW	North Canton, OH 44720

**Chain of Custody Record** 



🖧 eurofins Environment Testing Amer a

Phone: 330-497-9396 Fax: 330-497-0772					
Client Information	Sampler And Rew w	Lab PM: Brooks, Kris M	(ris M	Car ier Tracking No(s):	COC No: 240-87168-33282.1
lient Contact: lacob Krenz	Phone:	E-Mail: Kris.Brool	E-Mail: Kris.Brooks@Eurofinset.com	State of Origin:	Page: Page 1 of 1
ompany: RC Environmental Corporation.	PWSID:		Analvsis Requested	guested	Job #:
ddress: 540 Eisenhower Place	Due Date Requested:				eservation Codes.
ity. vnn Arbor	TAT Requested (days):				A HCL M Hexane B NaCH N None C Zn Acetate O AsNaO2
tate, Zip: //i 48108-7080	Compliance Project: A Yes A No				Nitric Acid P NaHSO4 Q
<sup>thone:</sup> 34-971 7080(Tel) 734-971-9022(Fax)	PO# TBD	(			MeOH Amchlor Ascorbic Acid
mai Krenz@trccompanies.com	W0 #;				lce U DI Water V
roject Name: karn/Weadock CCR Background Well	Project #: 24024154		:bC		K EDTA W pH 4-5 L EDA Z other (specify)
	SSOW#:		528-01	01000	Other -
sample identification	Sample Type Sample Date Time G=grab)	Matrix (Waweter (Waweter Sesolik, Oawestelol BTeThaue, ArAir)	Petrock Monol Petrock Macache 903.0, Razzera 904.0 Standard	nodenuk letoT	Special Instructions/Note
	X	1.583			
JW-15002	2 806 12-2- C	$\sim$			
JW 15008	10-10 21 1602 C.	Water			
JW 15016	22	Water			
JW 15019	10-7-110210	Water			
0UP-04	6 1-1 0	Water			
EB-04	10 7 21 1010 0	Water			
		Water			
ant	Poison B     Poison B     Poison B		Sample Disposal ( A fee may be Return To Client	Sample Disposal ( A fee may be assessed if samples are retained longer than 1 month) — Return To Client Disposal By Lab Mon	stained longer than 1 month) Archive For Months
ŏ			Require		
Empty Kit Relinquished by	Date:	Time.	e,	Method of Shipment:	
telinquished by	Depertures A(	Company	Received by	- Date/Tites K (	My Company
telinquished by C BY	10. 2. 21 1152	Company	Received by	Date/Time: $(O/K/2)$	III) Company G 2
	Date/Time: 1345	Company	Received of	Date/Time: C/ D	1 10 Company
Custody Seals Intact: Custody Seal No.			Cooler Temperature(s) °C and Other Remarks.	Remarks,	
					Ver: 06/08/2021

Eurofins TestAmerica Canton Sample Receipt Form/Narrative	Login # : <u>157750</u>
Canton Facility	Cooler unpacked by:
Chent TRC Site Name	
Cooler Received on 10/9/21 Opened on 10/9/21 FedEx 1 <sup>st</sup> Grd UPS FAS Chipper Chent Drop Off TestAmerica Courier	Trei T Other
<b>Receipt After-hours</b> Drop-off Date/Time $TC$ $[mg-2]$ Storage Location	Oner
	*****
COOLANT Wet Ice Blue Ice Dry Ice Water None	
1 Cooler temperature upon receipt See Multiple Cooler For	
IR GUN# IR-14 (CF +0.1 °C) Observed Cooler Temp °C Corrected Cooler ' IR GUN #IR-15 (CF +0.2 °C) Observed Cooler Temp °C Corrected Cooler	
	No <b>[</b>
	No NA Tests that are not
	No Receiving:
	No NA
	No VOAs
	No Oil and Grease
	NO
6 Was/were the person(s) who collected the samples clearly identified on the COC? (Yes 7 Did all bottles arrive in good condition (Unbroken)?	No No
	No
9 For each sample, does the COC specify preservatives $(Y/N)$ , # of containers $(Y/N)$ , and sa	umple type of grab/comp(Y/N)?
10 Were correct bottle(s) used for the test(s) indicated?	
11 Sufficient quantity received to perform indicated analyses?	
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 NO L WARDER
	No NA pH Strip Lot# <u>HC157842</u>
	No (NA
16 Was a VOA trip blank present in the cooler(s)? Trip Blank Lot # Yes	
17 Was a LL Hg or Me Hg trip blank present? Yes	No
Contacted PM Date by via Verbal V	oice 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 holds:	
Sample(s) were received	
Sample(s) were received with bubble >6 mm in	a diameter (Notify PM)
20. SAMPLE PRESERVATION	
Sample(s) were furt	ther preserved in the laboratory
Sample(s)were fur Time preservedPreservative(s) added/Lot number(s)	received in the moviniony
VOA Sample Preservation Date/Time VOAs Frozen.	

Login #

	4264/264/st			rofine TestAmerica	Canton Sample Rece	eipt Multiple Cooler Fo	>9.1
	alaa Di						
Co	oler De (Cir	escrip rcle)	tion	IR Gun # (Circle)	Observed Temp °C	Corrected Temp °C	Coolant (Circle)
(K	Client	вох	Other	(R-14) IR-15	3.0	31	Wettoe Blue Ice Dry Ice Water None
<u>A</u>	Client	Box	Other	IR-14 IR-15	24	2-5	Wet Ice Blue Ice Dry Ice Water None
<u>(</u>	Client	ŝox	Other	(R-74  R-15	18	1.9	Wellice Bluelice Drylice Water None
TA	Client	Box	Other	IR-14 IR-15			Wet Ice Blue Ice Dry Ice Water None
TA	Client	Box	Other	IR-14 IR-15			Wet Ice Blue Ice Dry Ice Water None
TA	Client	Box	Other	IR-14 IR-15			Wet Ice Blue Ice Dry Ice Water None
TA.	Client	Box	Other	IR-14 IR-15	······		Wet ice Blue ice Dry ice Water None
TA	Client	Box	Other	IR-14 IR-15			Wet Ice Blue Ice Dry Ice Water None
TA	Client	Box	Other	IR-14 IR-15			Wet Ice Blue Ice Dry Ice Water None
1A	Client	Вох	Other	IR-14 IR-15			Wet ice Blue ice Dry ice Water None
1A	Client	Box	Other	IR-14 IR-15			Wet Ice Blue Ice Dry Ice Water None
ţA	Client	8ox	Other	IR-14 IR-15	·····		Wellice Bluelice Drylice Water None
ţ <b>A</b>	Client	Box	Other	IR-14 IR-15			Wellice Bluelice Drylice Water None
<u>t</u> A	Client	Box	Other	IR-14 IR-15			Wellice Bluelice Drylice Water None
TA	Client	Box	Other	IR-74 IR-15			Wet Ice Blue Ice Dry Ice Water None
ŢA	Client	Box	Other	IR-14 IR-15	<u></u>		Wet Ice Blue Ice Dry Ice Water None
TA	Client	Вох	Other	IR-14 IR-15			Wet Ice Blue Ice Dry Ice Water None
TA	Client	Box	Other	IR-14 IR-15			Wet Ice Blue Ice Dry Ice Water None
TA	Client	Box	Other	IR-14 IR-15			Wet Ice Blue Ice Dry Ice Water None
TA	Client	Вох	Other	IR-14 IR-15		[	Wetice Blueice Drylce Water None
TA	Client	Box	Other	IR-14 IR-15	2000-00-00-00-00-00-00-00-00-00-00-00-00		Wetice Blueice Dryice Water None
TA	Client	Box	Other	IR-14 IR-15	<u></u>		Wetice Blueice Dryice Water None
TA.	Client	Box	Other	IR-14 IR-15			Wet ice Blue ice Dry ice Water None
TA	Client	Вох	Other	IR-14 IR-15			Wet Ice Blue Ice Dry Ice Water None
TA	Client	Box	Other	IR-14 IR-15			Wet ice Blue ice Dry ice Water None
TA.	Client	Box	Other	IR-14 IR-15	mmmn parameter and 2011 - 2012 / 2014 - 2014	] T	Wet Ice Blue Ice Dry Ice Water None
TA.	Client	Вох	Other	IR-14 IR-15			Wet ice Blue ice Dry ice Water None Wet ice Blue ice Dry ice
TA	Client	Box	Other	IR-14 IR-15			Water None
TA	Client	Box	Other	IR-14 IR-15	·····		Wet ice Blue ice Dry ice Water None Wet ice Blue ice Dry ice
TA	Client	Box	Other	IR-14 IR-15			Water None
TA	Client	Box	Other	IR-14 IR-15			Water None
TA	Client	Box	Other	iR-14 iR-15			Water None
TA	Client	Box	Other	IR-14 IR-15			Water None
TA	Client	Box	Other	IR-14 IR-15			Wet ice Biue ice Dry ice Water None
						See Ter	mperature Excursion Form

Temperature readings

Chent Sample ID	Lab ID	Container Type	Container Preservative pH Temp Added (mls) Lot #
MW 15002	240-157750-A 1	Plastic 1 liter Nitric Acid	<2
MW-15002	240-157750-В 1	Plastic 1 hter - Nitric Acid	<2
MW-15008	240-157750-A-2	Plastic 1 liter - Nitric Acid	<2
MW-15008	240-157750-В 2	Plastic 1 liter - Nitric Acid	<2
MW 15016	240-157750-A-3	Plastic 1 liter Nitric Acid	<2
MW-15016	240-157750-В-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-В-5	Plastic 1 liter - Nitric Acid	<2 1
EB-04	240-157750-A-6	Plastic 1 liter - Nitric Acid	<2 1

1 110110. 000-401-0000 L dy. 000-401-0112												America	ca
Client Information (Sub Contract Lab)	Sampler			Lab PM	-We			Ŭ	Carrier Tracking No(s)	No(s)	COC No:		
	Phone:			E-M	E-Mail:			5	State of Origin		240-143998.1 Page	1998.1	
onipping/receiving	_			Kris	Kris.Brooks@Eurofinset.com	Eurofinse	et.com		Michigan		Page 1 of 1	of 1	
TestAmerica Laboratories, Inc.					Accreditatio	ons Require	Accreditations Required (See note)				Job #:	760.4	
address: 13715 Rider Trail North,	Due Date Requested: 11/9/2021	:pe					Ana	Veie Door	1		Preservation C	z40-10770-1 Preservation Codes:	
City.	TAT Requested (days):	ays):						Lidiyais requested	Dalsa		A - HCL	M - Hexane	ane
Earth City State. Zip: MO, 63045											B - NaOH C - Zn Acetate D - Nitric Acid		e aO2 04S
Phone 314-298-8566(Tel) 314-298-8757(Fax)	# Od				Serve						F - MeOH G - Amchi		U - Na2SO3 R - Na2S2O3 S - H2SO4
	#OM				(0						H - Ascort I - Ice		Dodecahydral one
Project Name. Karn/Weadock CCR Groundwater Monitoring	Project #: 24024154				N JO SI						J - DI Water K - EDTA L - EDA		v - MCAA W - pH 4-5 Z - other (specify)
Site:	#MOSS				N) as		-				f cont		
		Sample	Sample Type (C=comp.	Matrix (w=water, S=solid. O=waste/oli.	3.0/PrecSep_5						a nedmuN ist		
	Sample Date		G=grab) Precerve	Bracenation Code	1	-						Special Instructions/Note:	ns/Note:
MW-15002 (240-157750-1)	10/7/21	80:60		Water		×					-	IVA protocol - Ra-226+228 action limit at	action limit a
MW-15008 (240-157750-2)	10/6/21	16:02		Water	: ×							5.0 pCi/L. TVA protocol - Ra-226+228 action limit at	action limit =
MW-15016 (240-157750-3)	10/7/21	10:10		Water			+				TVA proto	5.0 pCi/L. TVA protocol - Ra-226+228 action limit at	action limit a
MW-15019 (240-15750-4)	10/7/21	08:10		Water	×	+						5.0 pCi/L. TVA protocol - Ra-226+228 action limit at	action limit a
DUP-04 (240-157750-5)	10/7/21	Eastern		Water	×						_	5.0 pCi/L. TVA protocol - Ra-226+228 action limit at	action limit a
EB-04 (240-157750-6)	10/7/21	10:10 Eastern		Water	×	+			++			5.0 pCi/L. TVA protocol - Ra-226+228 action limit at 5.0 pCi/L.	action limit a
le. Since Jahntahnv arzradilatione are enhied to channe. Eurofino Touri													
This sample shipment is forwarded under charge, curums resymenta paces the ownership of method, analyte & accreditation compliance upon out subcontract laboratories. This sample shipment is forwarded under chain-of-custody. If the laboratory does not currently and the statemant accreditation compliance upon out subcontract laboratories. This sample shipment is forwarded under chain-of-custody. If the laboratory does not currently accreditation in the State of Origin listed above for analysisfiestification camples must be shipped back to the Eurofins TestAmerica aboratory or other instructions will be provided. Any changes to accreditation status should be brought to Eurofins TestAmerica attention mmediately. If all requested accreditations are current to date, return the signed Chain of Custody attesting to said complicance to Eurofins TestAmerica.	mence places the ownership matrix being analyzed, the sa rent to date, return the signed	o of method, ar mples must be Chain of Cust	nalyte & accrec s shipped back ody attesting to	titation compliar to the Eurofins said complicar	ice upon out TestAmerica ice to Eurofir	subcontrac laboratory is TestAme	of laboratorie.	s. This sample s uctions will be pr	nipment is for ovided. Any e	varded under o	hain-of-custody. If t editation status sho	the laboratory does i build be brought to Et	not currently irofins
Possible Hazard Identification					Sampl	e Dispos	sal ( A fee	may be asse	ssed if sa	mples are I	Sample Disposal ( A fee may be assessed if samples are retained longer than 1 month)	than 1 month)	
Uncontirmed Deliverable Requested: I, II, III, IV, Other (specify)	Primary Delivera	iverable Rank: 2			Special	Return To Client	o Client	Return To Client Disp	Disposal By Lab		Archive For	Months	hs
Empty Kit Relinquished by:					- interest				Method of Shinmost	binmont.			
Reinquished by HH	Date/Time:		1034	Company ETA		Received by:		FEDEX		Date/Time:		Company	
Relinquished by Relinquished by	Date/Time: Date/Time:			Company	Rec	MU	la K	Micha Kenin Win	\$	Date	1 2 2021 c	2 2021 09:05 COMPANY	AL SIL
				company of	าอน	eived by:				Date/Time:		Company	

### Login Sample Receipt Checklist

Client: TRC Environmental Corporation.

#### Login Number: 157750 List Number: 2 Creator: Korrinhizer Micha I

Creator: Korrinhizer, Micha L		
Question	Answer	Comment
Radioactivity wasn't checked or is = background as measured by a survey meter.</td <td>True</td> <td></td>	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	

N/A

Residual Chlorine Checked.

Job Number: 240-157750-1

List Creation: 10/12/21 05:16 PM

List Source: Eurofins TestAmerica, St. Louis

14

# 🔅 eurofins

# Environment Testing America

# **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

Brooks

Authorized for release by: 11/19/2021 8:00:40 PM

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

LINKS Review your project results through Total Access Have a Question? Ask The

Visit us at: www.eurofinsus.com/Env

Expert

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

3

# Qualifiers

Rad

Rad Qualifier	Qualifier Description	4
	Result is less than the sample detection limit.	*
		5
Glossary		3
Abbreviation	These commonly used abbreviations may or may not be present in this report.	6
¤	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	0
CNF	Contains No Free Liquid	0
DER	Duplicate Error Ratio (normalized absolute difference)	
Dil Fac	Dilution Factor	9
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)	13
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		
TEF	Relative Percent Difference, a measure of the relative difference between two points	
	Relative Percent Difference, a measure of the relative difference between two points Toxicity Equivalent Factor (Dioxin)	
TEQ		

### 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

5

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

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

Collected

10/04/21 13:37 10/08/21 08:00

10/04/21 14:46 10/08/21 08:00

10/04/21 11:39 10/08/21 08:00

10/04/21 12:32 10/08/21 08:00

10/04/21 00:00 10/08/21 08:00

Received

Matrix

Water

Water

Water

Water

Water

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

**Client Sample ID** 

DEK-MW-15002

DEK-MW-15004

DEK-MW-15005

DEK-MW-15006

DUP-DEK-BAP

Lab Sample ID

240-157688-1

240-157688-2

240-157688-3

240-157688-4

240-157688-5

Job ID: 240-157688-1

5
6
8
9

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

Job ID: 240-157688-1

Client Sample Date Collected: 10 Date Received: 10	0/04/21 13:37	,						Lab Sample	ID: 240-157 Matrix	
 Method: 903.0 - I	Radium-226	(GFPC)								
			Count Uncert.	Total Uncert.						
Analyte	Result	Qualifier	(2σ+/-)	(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 Fa
Ba Carrier	99.7		40 - 110					10/15/21 11:10	11/08/21 17:26	
Method: 904.0 - I	Radium-228	(GFPC)	Count Uncert.	Total Uncert.						
Analyte	Result	Qualifier	(2σ+/-)	(2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fa
Radium-228	0.827		0.384	0.391	1.00	0.567	pCi/L	10/15/21 11:44	11/08/21 13:11	
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 - Com	hined Rad	1ium-226 a	nd Radium	-228					
			Count	Total						
			Uncert.	Uncert.						

			Uncert.	Uncert.							
Analyte	Result	Qualifier	(2σ+/-)	(2 <del>σ+/-</del> )	RL	MDC	Unit	Prepared	Analyzed	Dil Fac	
Combined Radium	2.29		0.619	0.637	5.00	0.567	pCi/L		11/18/21 22:40	1	
226 + 228											

Total

Uncert.

(2**σ**+/-)

0.512

Count

Uncert.

(2<del>0</del>+/-)

0.487

Limits

40 - 110

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

**Result Qualifier** 

%Yield Qualifier

1.74

101

Client Sample ID: DEK-MW-15004

Method: 903.0 - Radium-226 (GFPC)

Date Collected: 10/04/21 14:46

Date Received: 10/08/21 08:00

Analyte

Carrier

Ba Carrier

Radium-226

Job ID: 240-157688-1

Lab Sample ID: 240-157688-2 **Matrix: Water** Prepared Analyzed Dil Fac 10/15/21 11:10 11/08/21 17:26 1 7 Prepared Analyzed Dil Fac 10/15/21 11:10 11/08/21 17:26 1

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

			Count Uncert.	Total Uncert.							
Analyte	Result	Qualifier	(2 <b>σ+/-</b> )	(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	

RL

1.00

MDC Unit

0.437 pCi/L

#### Method: Ra226 Ra228 - Combined Radium-226 and Radium-228

			Count	Total					
			Uncert.	Uncert.					
Analyte	Result	Qualifier	(2 <b>σ+/-</b> )	(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: TRC Environmental Corporation. Project/Site: Karn/Weadock CCR DEK Botte Ach D

Job ID: 240-157688-1

lient Sample ID: ate Collected: 10/04 ate Received: 10/08	4/21 11:39	Э						Lab Sample I		: Water
Method: 903.0 - Rac	dium-226	(GFPC)								
			Count	Total						
- <u>-</u> .			Uncert.	Uncert.			•			
Analyte		Qualifier	(2σ+/-)	<u>(2σ+/-)</u>		MDC		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
			Count Uncert.	Total Uncert.						
Analyte		Qualifier	(2σ+/-)	(2σ+/-)	RL		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_Ra2	228 - Con	nbined Rac	dium-226 a	and Radium	1-228					
			Count	Total						
			Uncert.	Uncert.						
Analyte	Result	Qualifier	(2σ+/-)	(2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
•										

226 + 228

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

Job ID: 240-157688-1

Lab Sample ID: 240-157688-4 Client Sample ID: DEK-MW-15006 Date Collected: 10/04/21 12:32 Matrix: Water Date Received: 10/08/21 08:00 Method: 903.0 - Radium-226 (GFPC) Total Count Uncert. Uncert. Analyte **Result Qualifier** (2<del>0</del>+/-) (2**σ**+/-) 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 40 - 110 10/15/21 11:10 11/08/21 17:27 Ba Carrier 105 1 Method: 904.0 - Radium-228 (GFPC) Count Total Uncert. Uncert. MDC Unit Analyte **Result Qualifier** (2**σ**+/-) (2**σ**+/-) RL Prepared Analyzed Dil Fac 0.472 pCi/L 10/15/21 11:44 11/08/21 13:11 Radium-228 0.704 0.327 0.333 1.00 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 82.2 40 - 110 10/15/21 11:44 11/08/21 13:11 Y Carrier 1 Method: Ra226 Ra228 - Combined Radium-226 and Radium-228 Count Total

		Uncert.	Uncert.						
Analyte	Result Qualifier	(2σ+/-)	(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: TRC Environmental Corporation. Project/Site: Karn/Weadock CCR DEK Bottom Ash Pond

Job ID: 240-157688-1

	5
	7
	8
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Lab Sample ID: 240-157688-5 Matrix: Water

10/15/21 11:44 11/08/21 13:12

**Client Sample ID: DUP-DEK-BAP** Date Collected: 10/04/21 00:00 Date Received: 10/08/21 08:00

Y Carrier

Method: 903.0 -		(/	• •							
			Count Uncert.	Total Uncert.						
Analyte	Result	Qualifier	(2 <b>σ</b> +/-)	(2 <b>σ</b> +/-)	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
-			40 - 110					10/10/21 11:10	11100/21 11.21	,
-		(GFPC)	Count	Total				10/10/21 11:10	11100/21 11:21	,
Method: 904.0 -		(GFPC)		Total Uncert.				10,10,21 11.10	1100021 11.21	,
-	Radium-228	(GFPC) Qualifier	Count		RL	MDC	Unit	Prepared	Analyzed	, Dil Fac
Method: 904.0 -	Radium-228	. ,	Count Uncert.	Uncert.	<b>RL</b> 1.00	<b>MDC</b> 0.499				Dil Fac
Method: 904.0 - Analyte	Radium-228	Qualifier	Count Uncert. (2σ+/-)	Uncert. (2σ+/-)				Prepared	Analyzed	Dil Fac 1 Dil Fac

#### Method: Ra226\_Ra228 - Combined Radium-226 and Radium-228

40 - 110

80.7

			Count	Total					
			Uncert.	Uncert.					
Analyte	Result	Qualifier	(2σ+/-)	(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

Prep Type: Total/NA

Prep Type: Total/NA

# Method: 903.0 - Radium-226 (GFPC)

Matrix: Water

			Percent Yield (Acceptance Limits)	
		Ва		
Lab Sample ID	Client Sample ID	(40-110)		5
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		8
LCSD 160-531995/2-A	Lab Control Sample Dup	90.4		C
MB 160-531995/20-A	Method Blank	82.4		6
				2
Tracer/Carrier Legend	1			

Ba = Ba Carrier

# Method: 904.0 - Radium-228 (GFPC)

**Matrix: Water** 

				Percent Yield (Acceptance Limits)	
		Ва	Y		
Lab Sample ID	Client Sample ID	(40-110)	(40-110)		13
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**

Job ID: 240-157688-1

## Method: 903.0 - Radium-226 (GFPC)

Lab Sample		60-5319	95/20-A						Clie	ent Samp	ole ID: Me		
Matrix: Wat											Prep Typ		
Analysis Ba	atch: 5362	236									Prep Bat	tch: 5	31995
				Count	Total								
		MB		Uncert.	Uncert.								
Analyte			Qualifier	(2σ+/-)	(2σ+/-)	RL	MDC			repared	Analyze		Dil Fa
Radium-226		-0.04114	U	0.120	0.120	1.00	0.258	pCi/L	10/1	5/21 11:10	11/12/21 1	0:22	
		МВ	МВ										
Carrier		%Yield	Qualifier	Limits					P	repared	Analyz	ed	Dil Fa
Ba Carrier		82.4		40 - 110					10/1	5/21 11:10	11/12/21 1	10:22	
_ab Sample		160-531	995/1-4					Cli	ent Sar	nnle ID:	Lab Con	trol S	amnl
Matrix: Wat			000/14							inpic ib.	Prep Typ		
Analysis Ba		97									Prep Ba		
						Total							••••
			Spike	LCS	LCS	Uncert.					%Rec.		
Analyte			Added	Result	Qual	(2 <b>σ+/-</b> )	RL	MDC	Unit	%Rec	Limits		
Radium-226			15.1	14.43		1.84	1.00	0.468	pCi/L	95	75 - 125		
	201	LCS											
Carrier		Qualifier	Limits										
Ba Carrier	96.4		40 - 110	_									
								<u></u>					
₋ab Sample Matrix: Wat		J 160-53	1995/2-A					Client S	ampie	ID: Lab	Control S Prep Typ		
Analysis Ba		07									Prep Bat		
Allalysis Do	atch. 5555	57				Total					гтер Ба	ICH. 5	3133
			Spike		LCSD	Uncert.					%Rec.		RE
Analyte			Added	Result		(2σ+/-)	RL	MDC	Unit	%Rec	Limits	RER	Lim
Radium-226			15.1	12.63		1.71	1.00		pCi/L	84	75 - 125	0.51	
	LCSD	LCSD											
Carrier		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	

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

#### Client Sample ID: DEK-MW-15002 Date Collected: 10/04/21 13:37 Date Received: 10/08/21 08:00

Date Receive	u. 10/06/21 0	0.00						
	Batch	Batch		Dilution	Batch	Prepared		
Prep Type	Туре	Method	Run	Factor	Number	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

1

#### Client Sample ID: DEK-MW-15004 Date Collected: 10/04/21 14:46 Date Received: 10/08/21 08:00

Analysis

Ra226 Ra228

Total/NA

-	Batch	Batch		Dilution	Batch	Prepared		
Prep Type	Туре	Method	Run	Factor	Number	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

537496 11/18/21 22:40 EMH

#### Client Sample ID: DEK-MW-15005 Date Collected: 10/04/21 11:39 Date Received: 10/08/21 08:00

-	Batch	Batch		Dilution	Batch	Prepared		
Prep Type	Туре	Method	Run	Factor	Number	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 Date Collected: 10/04/21 12:32 Date Received: 10/08/21 08:00

_	Batch	Batch		Dilution	Batch	Prepared		
Prep Type	Туре	Method	Run	Factor	Number	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

11/19/2021

**Matrix: Water** 

Matrix: Water

Lab Sample ID: 240-157688-1

Lab Sample ID: 240-157688-2

TAL SL

## Lab Sample ID: 240-157688-3

Lab Sample ID: 240-157688-4

Matrix: Water

**Matrix: Water** 

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

#### Client Sample ID: DUP-DEK-BAP Date Collected: 10/04/21 00:00 Date Received: 10/08/21 08:00

_	Batch	Batch		Dilution	Batch	Prepared		
Prep Type	Туре	Method	Run	Factor	Number	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 13:12	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

Job ID: 240-157688-1

Matrix: Water

Lab Sample ID: 240-157688-5

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

Eurofins TestAmerica, Canton

#### **Accreditation/Certification Summary**

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

#### Job ID: 240-157688-1

12 13

#### 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.

Eurofins TestAmerica, Canton	0.5/0 6 Chain of Custody Record	ody Record	MICHIGAN	🐝 curofins Environment Testing America
Client Information	Sampler: Ju Le Krent	Lab PM: Brooks, Kris M	Tracking No(s):	COC No: 240-87196-29052.1
Client Contact: Jacob Krenz	Phone: 734-345 -7804	E-Mail: Kris.Brooks@Eurofinset.com	State of Origin: com	Page: Page 1 of 1
Company: TRC Environmental Corporation.	PWSID:		Analysis Requested	# qop
Address: 1540 Eisenhower Place	Due Date Requested:			ň
City: Ann Arbor	TAT Requested (days):			B - NOL M - HEXANE B - NAOH N - None C - Zn Acetate 0 - ASNAO2
State. Zip: MI, 48108-7080	Compliance Project: A Yes A No			
Phone: 734-971-7080(Tel) 734-971-9022(Fax)	P0 # TBD	(c		
Email: JKrenz@trccompanies.com	WO #			
Project Name: Karn/Weadock CCR DEK Bottom Ash Pond	Project #: 24024154	EbC B2 OL		K - EDA L - EDA
Site	SSOW#:	228 GH		of cor Other:
	Sample Type Sample (C=comp,	(www.strix www.strix		190muM 1610
Sample Identification	Preservation Code:			
DEK-MW-15002	10-4-21 1337 C	XNN		
DEK-MW-15004	9 9/1/ 12-H-01	water WN XX		
DEK-MW-15005	10-4-21 1139 6	water W N X X		
DEK-MW-15006	0 2621 12-4-01	water NW XX		
DUP-DEK-BAP	10-4-21 6	water NN X X		
		Water		
			240-157688 Chain of Custody	
Possible Hazard Identification	Poison B	Sample Disposal ( A I	ee may be assessed if samples are	retained longer than 1 month) Archive For Months
Deliverable Requested: I, II, III, IV. Other (specify)		Special Instructi	Requirements:	
Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:	
Reinquefred by	$\frac{\text{Date/Time}}{10} - 7 - 31 / 1100 $	2	: day	1100
Reindustree by the contract of	7/21 1105	Company Received by	W BUC DIRECTION	-21 8.00 Congary
Custody Seals Intact: Custody Seal No.:			Cooler Temperature(s) °C and Other Remarks:	Cinduid
		5000		
		<b>13</b> 14	7 8 9 10 11	Act: 1008/2021

Eurofins TestAmerica Canton Sample Receipt Form/Narrative	Login # : 157688
Canton Facility	· · · · · · · · · · · · · · · · · · ·
Client CL Site Name	Cooler unpacked by:
Cooler Received on $10^{\circ}$ 8-21 Opened on $10^{\circ}$ 8-21	1 anduly Blex
FedEx: 1 <sup>st</sup> Grd Exp UPS FAS Clipper Client Drop Off TestAmerica Courier	Other/
Receipt After-hours: Drop-off Date/TimeStorage Location	
TestAmerica Cooler # Foam Box Client Cooler Box Other Packing material used: Bubble Wrap Foam Plastic Bag (None) Other	
COOLANT: Wet ke Blue Ice Dry Ice Water None	
1. Cooler temperature upon receipt $07 < \Box$ See Multiple Cooler For	m
IR GUN# IR-14 (CF +0.1 °C) Observed Cooler Temp. C Corrected Cooler	
IR GUN #IR-15 (CF +0.2°C) Observed Cooler Temp. °C Corrected Cooler	
	No NA Tests that are not
-Were tamper/custody seals on the bottle(s) or bottle kits (LLHg/MeHg)?	checked for pH by
-Were tamper/custody seals intact and uncompromised?	No NA Receiving:
3. Shippers' packing slip attached to the cooler(s)? Yes	
4. Did custody papers accompany the sample(s)? (Yes	No Oil and Grease TOC
5. Were the custody papers relinquished & signed in the appropriate place?	NO
<ul><li>6. Was/were the person(s) who collected the samples clearly identified on the COC? (Yes</li><li>7. Did all bottles arrive in good condition (Unbroken)?</li></ul>	No
8. Could all bottle labels (ID/Date/Time) be reconciled with the COC?	No
9. For each sample, does the COC specify preservatives $(Y/N)$ , # of containers $(Y/N)$ , and sa	
10. Were correct bottle(s) used for the test(s) indicated?	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
	No Charles and Lot Har Inc 13/042
	NO GIA
	(No-
17. Was a LL Hg or Me Hg trip blank present? Yes	Nø
Contacted PM Date by via Verbal V	oice Mail Other
Concerning	
18. CHAIN OF CUSTODY & SAMPLE DISCREPANCIES U additional next page	Samples processed by:
19. SAMPLE CONDITION	
Sample(s) were received after the recommended holdi	
	in a broken container.
Sample(s) were received with bubble >6 mm in	n diameter. (Notify PM)
20. SAMPLE PRESERVATION	
DRK-MULISARS	
Sample(s) DEK -MW - 15005 Time preserved: 9.45 Preservative(s) added/Lot number(s): 0000 - 275	ther preserved in the laboratory.
The preserved. <u>4. 15.</u> Treservative(s) added for humber(s). <u>10/10.</u> <u>2.1.</u>	
VOA Sample Preservation - Date/Time VOAs Frozen:	

WI-NC-099

## Login Container Summary Report

emperature readings:			
lient Sample ID	<u>Lab ID</u>	Container Type	<u>Container</u> <u>Preservative</u> pH Temp <u>Added (mls)</u> Lot #
EK-MW-15002	240-157688-A-1	Plastic 1 liter - Nitric Acid	<2
EK-MW-15002	240-157688-B-1	Plastic 1 liter - Nitric Acid	<2
EK-MW-15004	240-157688-A-2	Plastic 1 liter - Nitric Acid	<2
CK-MW-15004	240-157688-B-2	Plastic 1 liter - Nitric Acid	<2
K-MW-15005	240-157688-A-3	Plastic 1 liter - Nitric Acid	<2
CK-MW-15005	240-157688-B-3	Plastic 1 liter - Nitric Acid	<2
K-MW-15006	240-157688-A-4	Plastic 1 liter - Nitric Acid	<2
K-MW-15006	240-157688-B-4	Plastic 1 liter - Nitric Acid	<2
IP-DEK-BAP	240-157688-A-5	Plastic 1 liter - Nitric Acid	<2
JP-DEK-BAP	240-157688-B-5	Plastic 1 liter - Nitric Acid	<2

Eurofins TestAmerica, Canton															i.		
4101 Shuffel Street NW North Canton, OH 44720 Phone: 330-497-9396 Fax: 330-497-0772	0	hain c	of Cus	Chain of Custody Record	ecol	p									51110	Coversienced Testing America	of Testing
Client Information (Sub Contract Lab)	Sampler			Lab PM Brooks	Lab PM Brooks, Kris M	Σ				Ca	Carrier Tracking No(s)	(s)oN bu		COC No. 240-143943.	943.1		
Client Contact Shipping/Receiving	Phone			E-Mail. Kris B	E-Mail. Kris.Brooks@Eurofinset.com	DEurol	finset.c	E		Z Sta	State of Origin Michigan	c		Page Page 1 of 1	1		
Company TestAmerica Laboratories, Inc.					Accreditations Required (See note)	tions Re	quired (	See note	2					Job # 240-157688-1	688-1		
Address 13715 Rider Trail North,	Due Date Requested: 11/8/2021	÷						Ana	Analysis Requested	Reau	sted			Preserva	Preservation Codes:	5	
City Earth City	TAT Requested (days):	(s):												A - HCL B - NaOH C - Zn Acetate		M - Hexane N - None O - AsNaO2	
State. Zip MO, 63045														D - Nitric		Q - Na2O4S Q - Na2SO3	
Phone. 314-298-8566(Tel) 314-298-8757(Fax)	#04				(0									F - MeOH G - Amchi H - Ascort		R - Na2S2O3 S - H2SO4 T - TSD Dode	
Email	# OM															U - Acetone V - MCAA	caliyuale
Project Name Karn/Weadock CCR Groundwater Monitoring	Project # 24024154													K - EDTA L - EDA		W - pH 4-5 Z - other (specify)	city)
Site	#MOSS													of con			
Sample Identification - Client ID (Lab ID)	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (w=wator. S=solid, O=wastafoil, BT=Tissue, A=Air)	Field Filtered M/SM mione	-de2:097(0.506 0.4.0/PrecSep_6	Ra226Ra228_GF								Pecial Inc	Special Instructions/Note.	į
	X	X	1 00	Preservation Code:	- C	+	-										016.
DEK-MW-15002 (240-157688-1)	10/4/21	13:37 Eastern		Water		×	×							2 TVA prot	ocol - Ra-2	TVA protocol - Ra-226+228 action limit at	n limit at
DEK-MW-15004 (240-157688-2)	10/4/21	14:46 Eastern		Water		××	×							2 TVA prot	ocol - Ra-2	TVA protocol - Ra-226+228 action limit at	n limit at
DEK-MW-15005 (240-157688-3)	10/4/21	11:39 Eastern		Water		×	×							2 TVA prot	ocol - Ra-2	TVA protocol - Ra-226+228 action limit at	n limit at
DEK-MW-15006 (240-157688-4)	10/4/21	12:32 Eastern		Water		×	×							2 TVA prot	ocol - Ra-2	TVA protocol - Ra-226+228 action limit at 5.0 pci/l	n limit at
DUP-DEK-BAP (240-157688-5)	10/4/21	Eastern		Water		×	××							2 TVA prot 5.0 pCi/L	ocol - Ra-2	TVA protocol - Ra-226+228 action limit at 5.0 pCi/L.	n limit at
						+						_					
Note Since laboratory accreditations are subject to change. Eurofins TestAmerica places the ownership of method, analyte & accreditation compliance upon out subcontract laboratory accreditations are subject to change. Eurofins TestAmerica places the ownership of method, analyte & accreditation compliance upon out subcontract laboratory accreditation in the State of Origin listed above for analysis/lists/matrix being analyzed, the sampeed back to the Eurofins TestAmerica laboratory or other instructions will be provided. Any changes to accreditation status should be brought to Eurofins TestAmerica alternion in mediately. If all requested accreditations are current to date, return the signed Chain of Custody attesting to said complicance to Eurofins TestAmerica.	ica places the ownership ica places the ownership ica places the supred o date, return the signed	of method, an mples must be Chain of Cust	I alyte & accred shipped back ody attesting to	itation compliar to the Eurofins said complicar	TestAmer	out subo ica labo ofins Te	ontract la ratory or stAmeric	aboratori other ins	es. This structions	sample s will be pi	I I I I I I I I I I I I I I I I I I I	forwarded	under chair to accredi	-of-custody. If ation status sh	the laboral ould be bro	ory does not c ught to Eurofir	urrently
Possible Hazard Identification					San	iple Di	sposa	I ( A fe	e may	be ass	ssed if	samples	are reta	Sample Disposal ( A fee may be assessed if samples are retained longer than 1 month	than 1	nonth)	
Unconfirmed Deliverable Destructed: 1-11-111-117 Others (consists)	Drimon: Dolinorable Dould	c Doubu D				Retu	Return To Client	Client	-   		Disposal By Lab	Lab		Archive For		Months	
ververavie requested it. II, II, V. Onier (specify)					ed c	cial Ins	struction	ns/ac	special instructions/UC Requirements	ements							
Empty hit keiinquished by:		Date:			Time:						Method	Method of Shipment	ut:				
	Date/Time: 10-6-21	15	4 S	E10	<u>.</u>	Received by	d by	۲.	FEDEX	×		Date/Time	me			Company	
	Date/Time:		)	Company		Recently with	Ì ₹	$\mathbf{J}$				a Malana	a L	$V_{1707}$	SUNS	Company S	277
	Date/Time		-	Company		Second	by:					Date/Time	me	]			
Custody Seals Intact: Custody Seal No.: Δ Yes Δ No					J	Cooler T	emperatu	ure(s) °C	Cooler Temperature(s) °C and Other Remarks	er Remar	s						
		1	4			14	13	12	11	10	9	8	7	6	5	Ver: 06/08/202	2

Eurofins TestAmerica, Canton

#### Login Sample Receipt Checklist

Client: TRC Environmental Corporation.

#### Login Number: 157688 List Number: 2 Creator: Johnson, Autumn R

Creator: Johnson, Autumn R		
Question	Answer	Comment
Radioactivity wasn't checked or is = background as measured by a survey meter.</td <td>True</td> <td></td>	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	

False

Residual Chlorine Checked.

Job Number: 240-157688-1

List Creation: 10/11/21 04:16 PM

List Source: Eurofins TestAmerica, St. Louis

# 🔅 eurofins

## Environment Testing America

## **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

Brooks

Authorized for release by: 11/19/2021 8:15:10 PM

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

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.

LINKS **Review your project** results through Total Access Have a Question? Ask-The Expert Visit us at: www.eurofinsus.com/Env

## **Table of Contents**

1
2
3
4
5
6
7
9
10
12
13
14
15
20

## Client: TRC Environmental Corporation. Project/Site: Karn/Weadock CCR Bottom ash Pond

3

5

#### Qualifiers

Ra	d	
Qua	alifier	Qualifier Description
*		LCS or LCSD is outside acceptance limits.
U		Result is less than the sample detection limit.

#### Glossary

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

#### 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

Method Description	Protocol	Laboratory
Radium-226 (GFPC)	EPA	TAL SL
Radium-228 (GFPC)	EPA	TAL SL
Combined Radium-226 and Radium-228	TAL-STL	TAL SL
Preparation, Precipitate Separation (Standard In-Growth)	None	TAL SL
Preparation, Precipitate Separation	None	TAL SL
erences:		
	Radium-226 (GFPC) Radium-228 (GFPC) Combined Radium-226 and Radium-228 Preparation, Precipitate Separation (Standard In-Growth)	Radium-226 (GFPC)EPARadium-228 (GFPC)EPACombined Radium-226 and Radium-228TAL-STLPreparation, Precipitate Separation (Standard In-Growth)NonePreparation, Precipitate SeparationNone

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

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

5
6
8
9

Job ID: 240-157754-1

#### **Client Sample Results**

#### Client: TRC Environmental Corporation. Project/Site: Karn/Weadock CCR Bottom ash Pond

Analyte

Carrier

Ba Carrier

Radium-226

Job ID: 240-157754-1

#### Lab Sample ID: 240-157754-1 Client Sample ID: DEK-MW-15003 Date Collected: 10/07/21 07:27 **Matrix: Water** Date Received: 10/09/21 10:10 Method: 903.0 - Radium-226 (GFPC) Total Count Uncert. Uncert. **Result Qualifier** (2<del>0</del>+/-) (2**σ**+/-) RL MDC Unit Prepared Analyzed Dil Fac 0.838 0.381 0.389 1.00 0.469 pCi/L 10/15/21 11:10 11/08/21 17:32 1 %Yield Qualifier Limits Prepared Analyzed Dil Fac 40 - 110 10/15/21 11:10 11/08/21 17:32 103 1 Method: 904.0 - Radium-228 (GFPC)

#### Count Total Uncert. Uncert. Analyte **Result Qualifier** (2**σ**+/-) (2**σ**+/-) RL MDC Unit Prepared Analyzed Dil Fac Radium-228 0.194 U 0.278 0.279 0.466 pCi/L 10/15/21 11:44 11/08/21 13:15 1.00 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

			Count	Total						
			Uncert.	Uncert.						
Analyte	Result	Qualifier	(2 <b>σ+/-</b> )	(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

Eurofins TestAmerica, Canton

#### **Client Sample Results**

#### Client: TRC Environmental Corporation. Proje

Job ID: 240-157754-1

Client Sample Date Collected: 1 Date Received: 1	0/07/21 06:32	2						Lab Sample	ID: 240-157 Matrix	
Method: 903.0 -	Radium-226	(GFPC)								
		. ,	Count	Total						
			Uncert.	Uncert.						
Analyte	Result	Qualifier	(2σ+/-)	(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)	Count Uncert.	Total Uncert.						
	Result	Qualifier	(2σ+/-)	(2σ+/-)	RL		Unit	Prepared	Analyzed	Dil Fa
	Result 0.979		<b>(2σ+/-)</b> 0.366	(2σ+/-) 0.377	<b>RL</b> 1.00	<b>MDC</b> 0.498	-	Prepared 10/15/21 11:44	Analyzed 11/08/21 13:16	Dil Fac
	0.979		. ,	<u> </u>			-			Dil Fac
Radium-228	0.979	*	0.366	<u> </u>			-	10/15/21 11:44	11/08/21 13:16	
	0.979 %Yield	*	0.366	<u> </u>			-	10/15/21 11:44 <b>Prepared</b> 10/15/21 11:44	11/08/21 13:16 Analyzed	

		Uncert.	Uncert.					
Analyte	Result Qualifier	(2σ+/-)	(2 <del>σ+/-</del> )	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

## Method: 903.0 - Radium-226 (GFPC)

#### Matrix: Water

				Percent Yield (Acceptance Limits)	
		Ва			
Lab Sample ID	Client Sample ID	(40-110)			5
240-157754-1	DEK-MW-15003	103			
240-157754-2	DEK-MW-18001	109			
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	Ł				8
Ba = Ba Carrier					9
Method: 904.0 - R	adium-228 (GFPC)				
Matrix: Water				Prep Type: Total/NA	
				Percent Yield (Acceptance Limits)	
		Ва	Y		
Lab Sample ID	Client Sample ID	(40-110)	(40-110)		

		Ба	ľ		
Lab Sample ID	Client Sample ID	(40-110)	(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		
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

Eurofins TestAmerica, Canton

#### **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)

Carrier

Ba Carrier

Y Carrier

%Yield Qualifier

82.4

89.0

Limits

40 - 110

40 - 110

<b>Matrix: Water</b>		60-5319	95/20-A						Client Sam	ple ID: Metho	
Analysis Bate		36								Prep Type: 1 Prep Batch:	
Analysis Date	511. 5562	MB	МВ	Count Uncert.	Total Uncert.					Flep Batch.	551990
Analyte		Result	Qualifier	(2 <b>σ</b> +/-)	(2 <b>σ</b> +/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226		-0.04114	U	0.120	0.120	1.00	0.258	pCi/L	10/15/21 11:10	0 11/12/21 10:22	1
		MR	МВ								
Carrier			Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier		82.4		40 - 110					10/15/21 11:10		
Lab Sample II		160 531	995/1-1					Cliv	ent Sample ID	Lab Control	Sample
Matrix: Water		100-331	333/1-A					Cin		Prep Type: 1	
Analysis Bate		97								Prep Batch:	
		•				Total					
			Spike	LCS	LCS	Uncert.				%Rec.	
Analyte			Added	Result	Qual	(2σ+/-)	RL	MDC	Unit %Rec	Limits	
Radium-226			15.1	14.43		1.84	1.00	0.468	pCi/L 95	75 - 125	
	LCS	LCS									
Carrier	%Yield	Qualifier	Limits								
Ba Carrier	96.4		40 - 110	-							
Lab Sample I		160.53	1005/2-1					Client S	ample ID: Lab	Control Sam	
Matrix: Water		100-55	1333/2-A					onent o		Prep Type: 1	
Analysis Bato		97								Prep Batch:	
						Total					
			Spike	LCSD	LCSD	Uncert.				%Rec.	RER
Analyte			Added	Result	Qual	(2σ+/-)	RL	MDC	Unit %Rec	Limits RE	R Limi
			15.1	12.63		1.71	1.00	0.582	pCi/L 84	75-125 0.5	51 1
Radium-226											
Radium-226	LCSD	LCSD									
Radium-226 <i>Carrier</i>		LCSD Qualifier	Limits								
			Limits 40 - 110	-							
<b>Carrier</b> Ba Carrier	<b>%Yield</b> 90.4	Qualifier	40 - 110								
<b>Carrier</b> Ba Carrier	<b>%Yield</b> 90.4	Qualifier	40 - 110								
Carrier Ba Carrier Iethod: 904	%Yield 90.4 •.0 - Ra	Qualifier	40 - 110 228 (GFPC						Client Sam	ple ID: Metho	d Blank
Carrier Ba Carrier lethod: 904 Lab Sample II	%Yield 90.4 .0 - Ra D: MB 1	Qualifier	40 - 110 228 (GFPC						Client Sam	ple ID: Metho Prep Type: 1	
Carrier Ba Carrier Iethod: 904 Lab Sample II Matrix: Water	%Yield 90.4 •.0 - Ra D: MB 1	Qualifier dium-2 60-5319	40 - 110 228 (GFPC						Client Sam	•	otal/NA
Carrier Ba Carrier Iethod: 904 Lab Sample II Matrix: Water	%Yield 90.4 •.0 - Ra D: MB 1	Qualifier dium-2 60-5319 05	40 - 110 228 (GFPC		Total				Client Sam	Prep Type: 1	otal/NA
Carrier Ba Carrier Iethod: 904 Lab Sample II Matrix: Water Analysis Bate	%Yield 90.4 •.0 - Ra D: MB 1	Qualifier dium-2 60-5319 05 MB	40 - 110 228 (GFPC 98/20-A MB	Count Uncert.	Uncert.					Prep Type: 1 Prep Batch:	Total/NA 531998
Carrier Ba Carrier Iethod: 904 Lab Sample II Matrix: Water	%Yield 90.4 •.0 - Ra D: MB 1	Qualifier dium-2 60-5319 05 MB	40 - 110 228 (GFPC 98/20-A MB Qualifier	Count			<b>MDC</b> 0.526		Client Sam	Prep Type: 1 Prep Batch: Analyzed	<b>Total/NA</b> 531998 Dil Fac

Dil Fac

1

1

Analyzed

Prepared

10/15/21 11:44 11/08/21 13:16

10/15/21 11:44 11/08/21 13:16

#### **QC Sample Results**

Job ID: 240-157754-1

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

Matrix: Wat		8/1 <b>-A</b>					Clie	ent Sai	nple ID:	Lab Cont Prep Typ	e: Tot	al/NA
Analysis Ba	atch: 535393				Total					Prep Bat	tch: 53	31998
		Spike	LCS	LCS	Uncert.					%Rec.		
Analyte		Added	Result	Qual	(2σ+/-)	RL	MDC	Unit	%Rec	Limits		
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										
		98/2-4					Client S	amnlo	ID: I ah	Control S	ample	
Lab Sample	e ID: LCSD 160-5319 ter	98/2-A					Client S	ample	ID: Lab	Control S Prep Typ		
Lab Sample Matrix: Wat		98/2-A				(	Client S	ample	ID: Lab		e: Tot	al/NA
Lab Sample Matrix: Wat	ter	98/2-A			Total		Client S	ample	ID: Lab	Prep Typ	e: Tot	al/NA
Lab Sample Matrix: Wat	ter	98/2-A Spike	LCSD	LCSD	Total Uncert.		Client S	ample	ID: Lab	Prep Typ	e: Tot	al/NA
Lab Sample Matrix: Wat Analysis Ba	ter		LCSD Result			RL	Client S MDC	-	ID: Lab %Rec	Prep Typ Prep Bat	e: Tot	al/NA 31998
Lab Sample Matrix: Wat Analysis Ba Analyte	ter	Spike			Uncert.			Unit		Prep Typ Prep Bat %Rec.	e: Tot tch: 53	al/NA 31998 RER
Lab Sample Matrix: Wat Analysis Ba	ter	Spike Added	Result		Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	Prep Typ Prep Bat %Rec. Limits	e: Tot tch: 53	al/NA 31998 RER Limit
Lab Sample Matrix: Wat Analysis Ba	ter atch: 535393 	Spike Added	Result		Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	Prep Typ Prep Bat %Rec. Limits	e: Tot tch: 53	al/NA 31998 RER Limit
Lab Sample Matrix: Wat Analysis Ba Analyte Radium-228	ter atch: 535393 	Spike Added 12.2	Result		Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	Prep Typ Prep Bat %Rec. Limits	e: Tot tch: 53	al/NA 31998 RER Limit

Eurofins TestAmerica, Canton

#### **QC Association Summary**

Client: TRC Environmental Corporation. Project/Site: Karn/Weadock CCR Bottom ash Pond Job ID: 240-157754-1

## Rad

Prep	<b>Batch:</b>	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	
	Client Sample ID	Ргер Туре	Matrix	Method	Prep Batch
	Client Sample ID DEK-MW-15003	Prep Type Total/NA	Matrix Water	Method PrecSep_0	Prep Batch
Prep Batch: 531998           Lab Sample ID           240-157754-1           240-157754-2	·	<u> </u>			Prep Batch
Lab Sample ID 240-157754-1 240-157754-2	DEK-MW-15003	Total/NA	Water	PrecSep_0	Prep Batch
Lab Sample ID 240-157754-1	DEK-MW-15003 DEK-MW-18001	Total/NA Total/NA	Water Water	PrecSep_0 PrecSep_0	Prep Batch

#### Client: TRC Environmental Corporation. Project/Site: Karn/Weadock CCR Bottom ash Pond

#### Client Sample ID: DEK-MW-15003 Date Collected: 10/07/21 07:27 Date Received: 10/09/21 10:10

	Batch	Batch		Dilution	Batch	Prepared		
Prep Type	Туре	Method	Run	Factor	Number	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 Date Collected: 10/07/21 06:32 Date Received: 10/09/21 10:10

—	Batch	Batch		Dilution	Batch	Prepared		
Prep Type	Туре	Method	Run	Factor	Number	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

Lab Sample ID: 240-157754-1 Matrix: Water

Job ID: 240-157754-1

**Matrix: Water** 

# 5 Lab Sample ID: 240-157754-2

Eurofins TestAmerica, Canton

#### **Accreditation/Certification Summary**

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

#### Job ID: 240-157754-1

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	8	3	
1	1	2	2
			6

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
lowa	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.

Eurofins TestAmerica, Canton			NUTION	
4101 Shuffel Street NW North Canton, OH 44720	Chain of Cus	ain of Custody Record		Environment Testing America
Phone: 330-497-9396 Fax: 330-497-0772	ľ	1	190	
Client Information	JAUX JASY	Brooks, Kris M	Carner Tracking No(s):	COC No: 240-87197-29053.1
Client Contact: Jacob Krenz	Phone FUS La Jalo	E-Mail: Kris.Brooks@Eurofinset.com	State of Origin:	Page: Page 1 of 1
Company: TRC Environmental Corporation.	DISMA	•	Analysis Requested	Job #:
Address: 1540 Eisenhower Place	Due Date Requested:			۰ö
City Ann Arbor	TAT Requested (days):			A - HCL M - Hexane B - NaOH N - None C - 7n Acetate O - AcNaO2
State. Zip: MI, 48108-7080	Compliance Project: A Yes A No			
Phone: 734-971-7080(Tei) 734-971-9022(Fax)	PO#: TBD	(1		F - MeOH R - Na2S203 G - Amchlor S - H2SO4 H According Acid T TSD Didombination
Email: JKrenz@trccompanies.com	WO#:			I - Ice J - DI Water
Project Name: Karn/Weadock CCR DEK Bottom Ash Pond & I	Project #: 24024154	bC Be ol j		K - EDTA   L - EDA
Site:	SSOW#:	228 <sup>-</sup> GH		Other:
	Sample Type Sample (C=comp,	Matrix Matrix (Www.ast. (Www.ast.) (Id Filtered : form MS/M form M		19dmuki Isi
Sample Identification	ime G=grab)	003 003 003 003 003 003 003 003 003 003		Special Instructions/Note:
DEK-MW-15003	and intrivi			
DEK-MW-18001		Water N & TT		
(300 an 1003)		Water		
		7		
				NO NO NO
				1 OF YEL
		240-157754	240-157754 Chain of Custody	- And
		Sample Disposal ( A	fee may be assessed if samples are retai	are retained longer than 1 month)
└── <i>Non-Hazard</i>	Poison B Wunknown Radiological	Return To Client Disp Special Instructions/OC Requirements.	oosal By Lab	Archive For Months
Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:	
C	Date The State	Company Received by	Date/Time:	17ce Company
Reinquisibled by A	Date/Time: 10.8.21 1152	Company Received by	Date/Time:	W IUL Company
	21 1345	Company Repetived by	Date/Time:	1/ 10/0 COMPANY
Custody Seals/intact: Custody Seal No.: ∆ Yes ⊰ No		Cooler Temperature(s	Cooler Temperature(s) °C and Other Remarks:	
		12 13 14	7 8 9 10 11	1 2 3 4 5 6

Eurofins TestAmerica Canton Sample Receip	t Form/Narrative		Login # :
Canton Facility			Contractional barr
Client TRC	Site Name		Cooler unpacked by:
Cooler Received on 10/9/21	Opened on <u>10 9121</u>		Treil
FedEx: 1 <sup>st</sup> Grd UPS FAS Clipper, (			Other
Receipt After-hours: Drop-off Date/Time TC			
TestAmerica Cooler # Foam Box Packing material used: Bubble Wrap Foa	Client Cooler Box am Plastic Bag None	Other	
The second se	Dry Ice Water None		
1. Cooler temperature upon receipt	/	tiple Cooler Fo	m
IR GUN# IR-14 (CF +0.1 °C) Observed Co		-	
IR GUN #IR-15 (CF +0.2°C) Observed Co			
2. Were tamper/custody seals on the outside of th	e cooler(s)? If Yes Quantity_	1 000	s No
-Were the seals on the outside of the cooler(s			No NA Tests that are not checked for pH by
-Were tamper/custody seals on the bottle(s) of	r bottle kits (LLHg/MeHg)?	Yes	Receiving:
-Were tamper/custody seals intact and uncom	-		S NO NA
3. Shippers' packing slip attached to the cooler(s)?			SONO VOAs
4. Did custody papers accompany the sample(s)?			No Oil and Grease
5. Were the custody papers relinquished & signed			s No
6. Was/were the person(s) who collected the samp	-	VC? Yes	No No
<ol> <li>Did all bottles arrive in good condition (Unbrok</li> <li>Could all bottle labels (ID/Date/Time) be recond</li> </ol>		-	No
<ol> <li>9. For each sample, does the COC specify preservation</li> </ol>			
10. Were correct bottle(s) used for the test(s) indica			No
11. Sufficient quantity received to perform indicate		$\smile$	No
12. Are these work share samples and all listed on t		Yes	No
If yes, Questions 13-17 have been checked at the	ne originating laboratory.		_
13. Were all preserved sample(s) at the correct pH u	pon receipt?		No NA pH Strip Lot# HC157842
14. Were VOAs on the COC?			
15. Were air bubbles >6 mm in any VOA vials?			No NA
16. Was a VOA trip blank present in the cooler(s)?			No No
17. Was a LL Hg or Me Hg trip blank present?		105	
Contacted PM Date	by v	via Verbal V	voice Mail Other
Concerning			
			······
<b>18. CHAIN OF CUSTODY &amp; SAMPLE DISCR</b>	EPANCIES additional	next page	Samples processed by:
19. SAMPLE CONDITION			
Sample(s)v	vere received after the recomm	nended hold	ing time had expired.
Sample(s)		vere received	in a broken container.
Sample(s)		ble >6 mm i	n diameter. (Notify PM)
20. SAMPLE PRESERVATION			
Sample(s)		were fur	ther preserved in the laboratory.
Sample(s) Time preserved:Preservative(s) add	ed/Lot number(s):		
VOA Sample Preservation - Date/Time VOAs Froz	zen:		

Login # : \_

<b>Cooler Description</b>	IR Gun #	Observed	Corrected	Coolant
(Circle)	(Circle)	Temp °C	Temp °C	(Circle)
TA Client Box Other	R-14 IR-15	3.0	31	Wetter Blue ice Dry k Water None
A Client Box Other	18-1,4) IR-15	2.4	2-5	Webce Blue Ice Dry ic Water None
Te Client Box Other	IR-TA IR-15	1-8	1-9	Wellce Blue ice Dry ic Water None
TA Client Box Other	IR-14 IR-15		in the second	Wet Ice Blue Ice Dry k Water None
TA Client Box Other	IR-14 IR-15			Wet Ice Blue Ice Dry Ic Water None
TA Client Box Other	IR-14 IR-15			Wet Ice Blue Ice Dry Ic Water None
TA Client Box Other	IR-14 IR-15		an a	Wet Ice Blue Ice Dry Ic Water None
TA Client Box Other	IR-14 IR-15		and a second	Wet ice Blue ice Dry ic Water None
TA Client Box Other	IR-14 IR-15			Wet Ice Blue Ice Dry Ic Water None
TA Client Box Other	IR-14 IR-15			Wet ice Blue ice Dry ic Water None
TA Client Box Other	IR-14 IR-15		1	Wet ice Blue ice Dry ic Water None
TA Client Box Other	IR-14 IR-15			Wet Ice Blue Ice Dry Ic Water None
TA Client Box Other	IR-14 IR-15			Wet Ice Blue Ice Dry Ic Water None
TA Client Box Other	IR-14 IR-15			Wet Ice Blue Ice Dry Ic Water None
TA Client Box Other	IR-14 IR-15			Wet Ice Blue Ice Dry Ic Water None
TA Client Box Other	IR-14 IR-15			Wet Ice Blue Ice Dry Ic Water None
TA Client Box Other	IR-14 IR-15			Wet Ice Blue Ice Dry Ic Water None
TA Client Box Other	IR-14 IR-15			Wet Ice Blue Ice Dry Ic Water None
TA Client Box Other	IR-14 IR-15			Wet Ice Blue Ice Dry Ic Water None
TA Client Box Other	IR-14 IR-15			Wet Ice Blue Ice Dry Ic Water None
TA Client Box Other	IR-14 IR-15			Wet ice Blue ice Dry k Water None
TA Client Box Other	IR-14 IR-15			Wet ice Blue ice Dry ic Water None
TA Client Box Other	IR-14 IR-15			Wet Ice Blue Ice Dry k Water None
TA Client Box Other	IR-14 IR-15			Wet ice Blue ice Dry k Water None
TA Client Box Other	IR-14 IR-15			Wet ice Blue ice Dry k Water None
TA Client Box Other	IR-14 IR-15			Wet ice Blue ice Dry ic Water None
TA Client Box Other	IR-14 IR-15			Wet ice Blue ice Dry k Water None
TA Client Box Other	IR-14 IR-15			Wet Ice Blue Ice Dry Ic Water None
TA Client Box Other	IR-14 IR-15			Wet Ice Blue Ice Dry k Water None
TA Client Box Other	IR-14 IR-15			Wet Ice Blue Ice Dry k Water None
TA Client Box Other	IR-14 IR-15			Wet Ice Blue Ice Dry Io Water None
TA Client Box Other	IR-14 IR-15			Wet Ice Blue Ice Dry Ic Water None
TA Client Box Other	IR-14 IR-15			Wet Ice Blue Ice Dry Ic Water None
TA Client Box Other	IR-14 IR-15			Wet Ice Blue Ice Dry Ic Water None

WI-NC-099 Cooler Receipt Form Page 2 - Multiple Coolers

### Login Container Summary Report

10/9/2021	Logi	n Container Summary	Report 240-157754	1
Temperature readings:				2
Client Sample ID	Lab ID	Container Type	<u>Container</u> <u>Preservative</u> <u>pH</u> <u>Temp</u> <u>Added (mls)</u> Lot #	3
DEK-MW-15003	240-157754-A-1	Plastic 1 liter - Nitric Acid	<2	4
DEK-MW-15003	240-157754-B-1	Plastic 1 liter - Nitric Acid		5
DEK-MW-18001	240-157754-A-2	Plastic 1 liter - Nitric Acid	<2	6
DEK-MW-18001	240-157754-B-2	Plastic 1 liter - Nitric Acid	<2	-
				8
				9
				0
				1
				2

Eurofins TestAmerica, Canton 4101 Shuffel Street NW

**Chain of Custody Record** 



Control Environment Testing

Client Information (Sub Contract Lab)	Sampler			Lab PM Brooks	Lab PM: Brooks, Kris M	5			<u>ö</u>	Carrier Tracking No(s)	ting No(s):		COC No 240-14	COC No: 240-143998.1		
Client Contact: Shipping/Receiving	Phone:			E-Ma Kris	E-Mait: Kris.Brooks@Eurofinset.com	Eurofins	et.com		šΣ	State of Origin Michigan	Ē		Page: Page 1 of 1	1 of 1		
Company TestAmerica Laboratories, Inc.					Accreditati	ons Requi	Accreditations Required (See note)	ote)	1	,			Job #	Job # 240.157754_1		Τ
Address 13715 Rider Trail North.	Due Date Requested: 11/9/2021	÷					¥	alysis	Analysis Requested	sted			Preser	Preservation Codes	8	Ι
City Earth City	TAT Requested (days):	(\$):											B NaC	OH Marte	M - Hexane N - None	
Slate. Zip. MO, 63045													D Nitr	D - Nitric Acid E - NaHSO4		
Phone: 314-298-8566(Tel) 314-298-8757(Fax)	#04					_							F - Me G - Am	OH Ichlor Sorbio Acid	R - Na2S203 S - H2SO4 T TEB Dedeetudeete	
Emait	# OM				(0)									Vater		late
Project Name. Karn/Weadock CCR Groundwater Monitoring	Project #: 24024154				1 10 88									A A	W - pH 4-5 Z - other (specify)	
Site:	SSOW#:				SD (Y								other:			
Sample Identification - Client ID (Lab ID)	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid. O=wasteroli, BT=Tissue, A=Art	M/SM monet	903.0\PrecSer_0 							Total Number	Special I	Special Instructions/Note	
	X	X		Preservation Code:	X											
DEK-MW-15003 (240-157754-1)	10/7/21	07:27 Fastern		Water		××					-	-	2 TVA pr	otocol - Ra	TVA protocol - Ra-226+228 action limit at	it at
DEK-MW-18001 (240-157754-2)	10/7/21	06:32 Eactorn		Water		×		$\vdash$					2 TVA pr	otocol - Ra	TVA protocol - Ra-226+228 action limit at	it at
						F					-	+				T
						1	-	-		1	1	+				
								-			_	+				Τ
							_	-			_	-				
Note: Since laboratory accreditations are subject to change. Eurofins TestAmenca places the ownership of method, analyte & accreditation compliance upon out subcontract laboratories. This sample shipment is forwarded under chain-of-custody. If the laboratory does not curmination accreditation in the State of Origin listed above for analysis/lests/matrix being analyzed. the samples must be shipped back to the Eurofins TestAmenca laboratory or other instructions will be provided. Any changes to accreditation status should be brought to Eurofins	StAmerica places the ownership simatrix being analyzed, the san	of method, an	alyte & accred shipped back	itation complia to the Eurofins	nce upon ou TestAmeric	t subcontr a laborato	act taborato	ories. This Instruction	s sample s s will be p	hipment is	forwarded ny change	d under ch	ain-of-custody.	If the labor should be b	whership of method, analyte & accreditation compliance upon out subcontract taboratories. This sample shipment is forwarded under chain-of-custody. If the laboratory does not currently ed, the samples must be shipped back to the Eurofins TestAmencia laboratory or other instructions will be provided. Any changes to accreditation status should be brought to Eurofins.	>
LestAmenca attention immediately. If all requested accreditations are current to date, return the signed Chain of Custody attesting to said complicance to Eurofins TestAmenica	urrent to date, return the signed (	Chain of Custo	dy attesting to	said complica	nce to Eurof	ins TestAr	nenca									
rossiume nazaro identification Unconfirmed						Return	le Disposal ( A I Return To Client	ee may	Disposed of sam	essed if osal Bv	sample: Lab	sarere	Sample Uisposal ( A fee may be assessed if samples are retained longer than 1 month) Return To Client Discosal Rv Lab	jer than 1	month) Months	
Deliverable Requested: I, II, III, IV. Other (specify)	Primary Deliverat	Deliverable Rank: 2			Speci	al Instru	Special Instructions/QC Requirements:	C Requir	ements:						SINIOM	Τ
Empty Kit Relinquished by:		Date:			Time:					Method	Method of Shipment	ant:				Τ
	Date/Time. 10-11-21		034	сотрапу БТА	Re	Received by:			FEDEX		Date/Time	me			Сотралу	
	Date/Time:		0	Company	8 B	Ceived by	Received by:	240			Date/T		2 2021	0.60	CB-05 Company C	б
	Date/Time:			Company	Re	telved by				6	Date/Time:	ime:				
Custody Seals Intact: Custody Seal No.: △ Yes △ No					3	oler Temp	Cooler Temperature(s) °C and Other Remarks:	C and Oth	her Remar	s						Γ

#### Login Sample Receipt Checklist

Client: TRC Environmental Corporation.

#### Login Number: 157754 List Number: 2 Creator: Korrinhizer, Micha I

Creator: Korrinhizer, Micha L		
Question	Answer	Comment
Radioactivity wasn't checked or is = background as measured by a survey meter.</td <td>True</td> <td></td>	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	

N/A

Residual Chlorine Checked.

Job Number: 240-157754-1

List Creation: 10/12/21 05:17 PM

List Source: Eurofins TestAmerica, St. Louis



#### **Technical Memorandum**

Date:	January 28, 2022
То:	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)<sup>1</sup>.

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.

<sup>&</sup>lt;sup>1</sup> 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 GWPS<sup>2</sup>
- Orange Statistically Significant GWPS Exceedances<sup>3</sup>

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

<sup>&</sup>lt;sup>2</sup> 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).

<sup>&</sup>lt;sup>3</sup> 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 ant 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<sup>™</sup> 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 2021<sup>4</sup>, as follows:

<sup>&</sup>lt;sup>4</sup> Given the dynamic nature of the groundwater surface water interactions, it is appropriate to look at a shorter timeframe for data analysis (one year).

- 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 Figure 2	Nature and Extent Summary: GWPS Exceedances 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

								0.1		MW-01					RA1/	V-03		MW-06					
								58	ample Location:	0/0/0004			40/4/0004	0/0/0004			40/4/0004	0/0/0004			40/4/0004		
	-		· · · ·			1		<u>.</u>	Sample Date:	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		
Constituent	Unit	GWPS*	MI	MI Non-	MI GSI^	MI AMV***	MI FAV***	Chronic	Acute MZ^^														
l			Residential**	Residential**				MZ^^															
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 <sup>EE</sup>	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 <sup>E</sup>	250 <sup>E</sup>	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 <sup>E</sup>	250 <sup>E</sup>	500 <sup>EE</sup>	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 <sup>E</sup>	500 <sup>E</sup>	500	NC	NC	NC	NC														
pH, Field	su	NA	6.5 - 8.5 <sup>E</sup>	6.5 - 8.5 <sup>E</sup>	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	211	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 <sup>E</sup>	300E	500,000 <sup>EE</sup>	NC	NC	NC	NC	128	110	136	227	64	164	149	222	1,500	2,060	1,560	1,490		
Copper	ug/L	NA	1,000E	1,000E	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	ua/L	NA	2.400	5.000E	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.

M - 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}.

<sup>H</sup> - 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.

<sup>1</sup> - 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

								Sa	mple Location:		MV	V-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
Constituent	Unit	GWPS*	MI Residential**	MI Non- Residential**	MI GSI^	MI AMV***	MI FAV***	Chronic MZ^^	Acute MZ^^							•		
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 <sup>EE</sup>	NC	NC	NC	NC	205	228	191	186	192	247	194	159	173
Chloride	mg/L	NA	250 <sup>E</sup>	250 <sup>E</sup>	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 <sup>E</sup>	250 <sup>E</sup>	500 <sup>EE</sup>	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 <sup>E</sup>	500 <sup>E</sup>	500	NC	NC	NC	NC									
pH, Field	su	NA	6.5 - 8.5 <sup>E</sup>	6.5 - 8.5 <sup>E</sup>	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 <sup>1</sup>	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 <sup>E</sup>	300 <sup>E</sup>	500,000 <sup>EE</sup>	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 <sup>E</sup>	1,000 <sup>E</sup>	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 <sup>E</sup>	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.

M - 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}.

<sup>H</sup> - 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.

<sup>1</sup> - 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

	Sample Location:									MW-12			MW-14						
									Sample Date:	3/2/2021	3/23/2021	5/4/2021	7/27/2021	10/4/2021	3/2/2021	3/23/2021	5/4/2021	7/27/2021	10/6/2021
Constituent	Unit	GWPS*	MI Residential**	MI Non- Residential**	MI GSI^	MI AMV***	MI FAV***	Chronic MZ <sup>^^</sup>	Acute MZ^^										
Appendix III																			
Boron	ug/L	NA	500	500	4,000	34,000	69,000	44,000	69,000	3,290	3,530	3,730	3,030	3,710	2,380	2,360	2,260	1,300	2,640
Calcium	mg/L	NA	NC	NC	500 <sup>EE</sup>	NC	NC	NC	NC	263	299	272	179	198	327	294	326	366	254
Chloride	mg/L	NA	250 <sup>E</sup>	250 <sup>E</sup>	50	320,000	640,000	NC	NC	51.9	49	50.5	65.9	58.2	79.9	64.3	67.6	29	56.7
Fluoride	ug/L	4,000	NC	NC	NC	9,800	20,000	NC	NC										
Sulfate	mg/L	NA	250 <sup>E</sup>	250 <sup>E</sup>	500 <sup>EE</sup>	600,000	1,200,000	NC	NC	402	512	397	201	252	606	537	651	1220	549
Total Dissolved Solids	mg/L	NA	500 <sup>E</sup>	500 <sup>E</sup>	500	NC	NC	NC	NC										
pH, Field	su	NA	6.5 - 8.5 <sup>E</sup>	6.5 - 8.5 <sup>E</sup>	6.5 - 9.0	NC	NC	NC	NC	7.2	7.0	7.2	7.3	7.1	7.1	6.6	7.1	7.0	6.9
Appendix IV																			
Antimony	ug/L	6	6.0	6.0	2.0	1,100	2,300	NC	NC										
Arsenic	ug/L	21¹	10	10	10	340	680	100	680	277	287	269	384	403	809	621	283	47	197
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
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	113	104	108	111	111	108	89	113	109	102
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	15	16	13	7	15	< 5	< 5	< 5	19	7
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	3	< 1	2	4	3	5	4	8	7
Thallium	ug/L	2	2.0	2.0	2.0	47	94	NC	NC										
MI Part 115 Parameters																			
Iron	ug/L	NA	300 <sup>E</sup>	300 <sup>E</sup>	500,000 <sup>EE</sup>	NC	NC	NC	NC	1,920	3,510	1,970	2,900	2,520	5,050	4,290	4,700	245	1,630
Copper	ug/L	NA	1,000 <sup>E</sup>	1,000 <sup>E</sup>	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
Zinc	ug/L	NA	2,400	5,000 <sup>E</sup>	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}.

<sup>H</sup> - 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 Janurary 14, 2019.

## Table 1 Summary of Groundwater Sampling Results (Analytical): March 2021 - October 2021 DE Karn Nature and Extent Monitoring Wells Essexville, Michigan

								Sa	mple Location:		MM	/-16		MW-22				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
Constituent	Unit	GWPS*	MI Residential**	MI Non- Residential**	MI GSI^	MI AMV***	MI FAV***	Chronic MZ^^	Acute MZ^^												
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 <sup>EE</sup>	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 <sup>E</sup>	250 <sup>E</sup>	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 <sup>E</sup>	250 <sup>E</sup>	500 <sup>EE</sup>	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 <sup>E</sup>	500 <sup>E</sup>	500	NC	NC	NC	NC												
pH, Field	su	NA	6.5 - 8.5 <sup>E</sup>	6.5 - 8.5 <sup>E</sup>	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 <sup>1</sup>	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 <sup>E</sup>	300 <sup>E</sup>	500,000 <sup>EE</sup>	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 <sup>E</sup>	1,000 <sup>E</sup>	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 <sup>E</sup>	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.

M - 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}.

<sup>H</sup> - 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.

<sup>1</sup> - 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

<b>[</b>								6.	male Leastion.		01	V-10		OW-11				OW-12			
								Sa	mple Location:	3/2/2021	5/4/2021	7/27/2021	10/7/2021					0w-12 3/2/2021 5/4/2021 7/27/2021 10/7/2021			
	1	1				1		<u>.</u>	Sample Date:	3/2/2021	5/4/2021	//2//2021	10/7/2021	3/2/2021	5/4/2021	7/27/2021	10/7/2021	3/2/2021	5/4/2021	7/27/2021	10/7/2021
Constituent	Unit	GWPS*	MI	MI Non-	MI GSI^	MI AMV***	MI FAV***	Chronic	Acute MZ^^												
			Residential**	Residential**				MZ^^													
Appendix III																					
Boron	ug/L	NA	500	500	4,000	34,000	69,000	44,000	69,000	1,380	1,300	872	1,400	3,050	3,300	3,190	3,580	906	747	721	1,060
Calcium	mg/L	NA	NC	NC	500 <sup>EE</sup>	NC	NC	NC	NC	103	107	127	140	14	12.9	9.32	9.44	84.9	75.1	62.4	91.8
Chloride	mg/L	NA	250 <sup>E</sup>	250 <sup>E</sup>	50	320,000	640,000	NC	NC	66	75.1	86.2	87.5	69	67.1	63.9	64.6	50	60.8	57.6	56.1
Fluoride	ug/L	4,000	NC	NC	NC	9,800	20,000	NC	NC	< 1,000	< 1,000	< 1,000	< 1,000	4,150	3,750	2,610	3,310	< 1,000	< 1,000	< 1,000	< 1,000
Sulfate	mg/L	NA	250 <sup>E</sup>	250 <sup>E</sup>	500 <sup>EE</sup>	600,000	1,200,000	NC	NC	2.62	< 1	122	70.2	25.4	25.6	25.8	23.9	165	139	118	173
Total Dissolved Solids	mg/L	NA	500 <sup>E</sup>	500 <sup>E</sup>	500	NC	NC	NC	NC	551	549	626	668	242	239	205	227	549	499	443	585
pH, Field	su	NA	6.5 - 8.5 <sup>E</sup>	6.5 - 8.5 <sup>E</sup>	6.5 - 9.0	NC	NC	NC	NC	7.0	7.1	7.0	7.0	9.1	9.2	9.4	9.5	7.0	7.2	7.1	7.2
Appendix IV																					
Antimony	ug/L	6	6.0	6.0	2.0	1,100	2,300	NC	NC	< 1	< 1	< 1	< 1	1	2	3	3	< 1	1	< 1	< 1
Arsenic	ug/L	21 <sup>1</sup>	10	10	10	340	680	100	680	3	4	4	4	711	742	497	738	121	86	86	105
Barium	ug/L	2,000	2,000	2,000	1,200	3,400	6,800	NC	NC	135	184	169	167	42	37	33	25	84	67	56	81
Beryllium	ug/L	4	4.0	4.0	33	300	600	NC	NC	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Cadmium	ug/L	5	5.0	5.0	2.5	12	24	NC	NC	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	0.6	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium	ug/L	100	100	100	11	16	32	NC	NC	1	4	1	1	< 1	< 1	< 1	3	< 1	< 1	< 1	< 1
Cobalt	ug/L	15	40	100	100	370	740	NC	NC	< 6	< 6	< 6	< 6	< 6	< 6	< 6	< 6	< 6	< 6	< 6	< 6
Fluoride	ug/L	4,000	NC	NC	NC	9,800	20,000	NC	NC	< 1,000	< 1,000	< 1,000	< 1,000	4,150	3,750	2,610	3,310	< 1,000	< 1,000	< 1,000	< 1,000
Lead	ug/L	15	4.0	4.0	14	250	500	NC	NC	< 1	2	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Lithium	ug/L	180	170	350	440	910	1,800	NC	NC	29	33	23	38	12	12	< 10	< 10	32	30	20	32
Mercury	ug/L	2	2.0	2.0	0.20#	1.4	2.8	NC	NC	< 0.2 <sup>H</sup>	< 0.2	< 0.2	< 0.2	< 0.2 <sup>H</sup>	< 0.2	< 0.2	< 0.2	< 0.2 <sup>H</sup>	< 0.2	< 0.2	< 0.2
Molybdenum	ug/L	100	73	210	120	29,000	58,000	NC	NC	< 5	< 5	9	< 5	317	297	253	236	11	13	16	17
Radium-226/228	pci/L	5	NC	NC	NC	NC	NC	NC	NC		1.01		1.77		< 0.498		1.41		0.530		2.08
Selenium	ug/L	50	50	50	5.0	62	120	55	120	1	3	14	4	2	3	5	5	< 1	1	1	2
Thallium	ug/L	2	2.0	2.0	2.0	47	94	NC	NC	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2
MI Part 115 Parameters																					
Iron	ug/L	NA	300 <sup>E</sup>	300 <sup>E</sup>	500,000 <sup>EE</sup>	NC	NC	NC	NC	1,480	2,070	1,230	1,730	35	40	128	64	4,440	2,520	3,470	6,110
Copper	ug/L	NA	1,000E	1,000E	20	33	66	NC	NC	2	6	3	2	< 1	< 1	2	< 1	1	< 1	< 1	< 1
Nickel	ug/L	NA	100	100	120	1,000	2,100	NC	NC	2	5	5	8	2	2	3	5	< 2	< 2	2	5
Silver	ug/L	NA	34	98	0.2	0.54	1.1	NC	NC	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Vanadium	ug/L	NA	4.5	62	27	79	160	NC	NC	2	6	11	3	429	536	1.120	1.000	< 2	< 2	< 2	< 2
Zinc	ua/L	NA	2.400	5,000E	260	260	520	NC	NC	< 10	12	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
		1 1/ 1	2,400	0,000	200	200	020	110		10				3 10	1 10	10	1 10	10		3 10	

#### 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}.

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<sup>H</sup> - 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.

<sup>1</sup> - 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

Sam							ample Location:	Location: T1-3GSI					T2-:	3GSI		T3-3GSI					
		_							Sample Date:	3/22/2021	5/5/2021	7/26/2021	10/5/2021	3/22/2021	5/5/2021	7/26/201	10/5/2021	3/22/2021	5/5/2021	7/26/201	10/5/2021
Constituent	Unit	GWPS*	MI Residential**	MI Non- Residential**	MI GSI^	MI AMV***	MI FAV***	Chronic MZ^^	Acute MZ^^												
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 <sup>EE</sup>	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 <sup>E</sup>	250 <sup>E</sup>	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 <sup>E</sup>	250 <sup>E</sup>	500 <sup>EE</sup>	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 <sup>E</sup>	6.5 - 8.5 <sup>E</sup>	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 <sup>1</sup>	10	10	10	340	680	100 <sup>2</sup>	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 <sup>E</sup>	300 <sup>E</sup>	500,000 <sup>EE</sup>	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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M - 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}.

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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.

<sup>1</sup> - Constituent triggered an Assessment of Corrective Measures for the Karn Bottom Ash Pond as described in TRC's letter report dated January 14, 2019.

<sup>2</sup> - 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

											Sample Location: T4-30					T5-3GSI				T6-3GSI			
		_							Sample Date:	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		
Constituent	Unit	GWPS*	MI Residential**	MI Non- Residential**	MI GSI^	MI AMV***	MI FAV***	Chronic MZ^^	Acute MZ^^														
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 <sup>EE</sup>	NC	NC	NC	NC	109	167	112	133	254	279	278	69.6	199	400	132	321		
Chloride	mg/L	NA	250 <sup>E</sup>	250 <sup>E</sup>	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 <sup>E</sup>	250 <sup>E</sup>	500 <sup>EE</sup>	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 <sup>E</sup>	6.5 - 8.5 <sup>E</sup>	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 <sup>1</sup>	10	10	10	340	680	100 <sup>2</sup>	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 <sup>E</sup>	300 <sup>E</sup>	500,000 <sup>EE</sup>	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}.

 $^{\mbox{\scriptsize EE}}$  - 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.

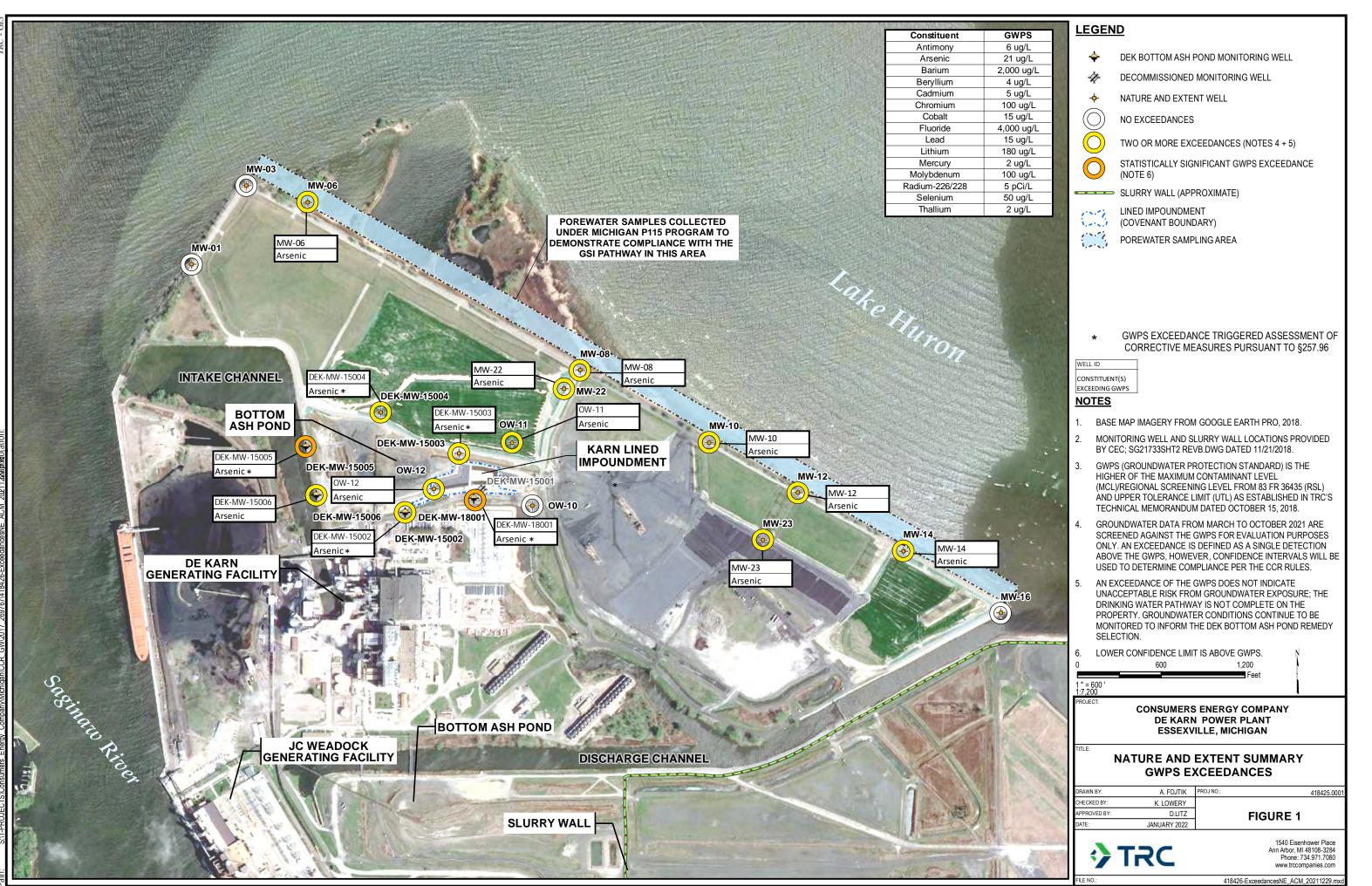
Result Indicates an exceedance of acute-based GSI criteria.

All metals were analyzed as total unless otherwise specified.

<sup>1</sup> - Constituent triggered an Assessment of Corrective Measures for the Karn Bottom Ash Pond as described in TRC's letter report dated January 14, 2019.

<sup>2</sup> - Compliance demonstrated on a flux basis.

### **Figures**





#### LEGEND



DECOMMISSIONED MONITORING WELL

NATURE AND EXTENT WELL

NO EXCEEDANCES

GSI TRANSECT LOCATION/POREWATER SAMPLE



-

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

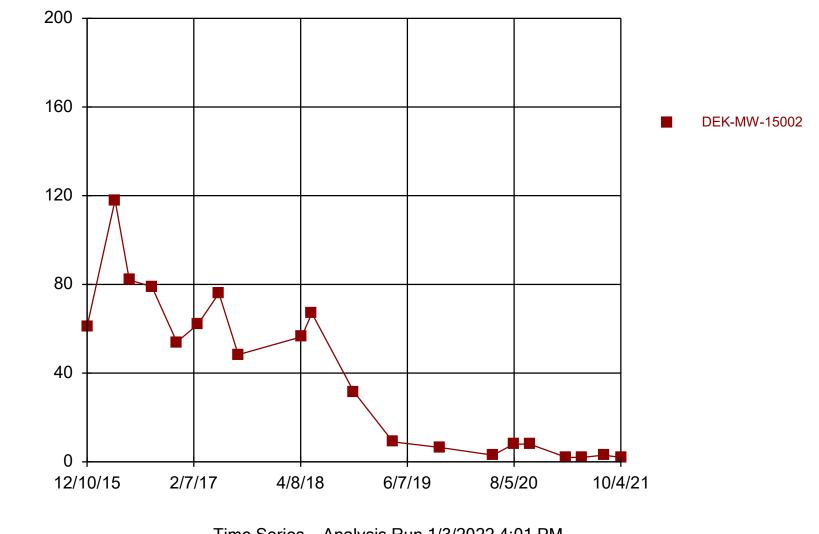
#### <u>NOTES</u>

T6-3GSI

- 1. BASE MAP IMAGERY FROM GOOGLE EARTH PRO, 2018.
- 2. MONITORING WELL AND SLURRY WALL LOCATIONS PROVIDED BY CEC; SG21733SHT2 REVB.DWG DATED 11/21/2018.
- MIXING ZONE GSI CRITERIA FROM MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY (MDEQ) APPROVAL LETTER DATED DECEMBER 23, 2015.
- 4. 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.

0	600	1,	,200 ■ Feet	Ň								
1 " = 600 ' 1:7,200												
PROJECT: CONSUMERS ENERGY COMPANY DE KARN POWER PLANT ESSEXVILLE, MICHIGAN												
	IC NATURE GSI PATHW											
DRAWN BY:	A. FOJTIK	PROJ NO .:		418425.0002								
CHECKED BY:	K. LOWERY											
APPROVED BY:	D. LITZ	1	FIGU	RE 2								
DATE:	JANUARY 2022		11001									
FILE NO.:	RC		Ann	540 Eisenhower Place Arbor, MI 48108-3284 Phone: 734.971.7080 ww.trccompanies.com								
				sNE GSI 20211229.mxd								

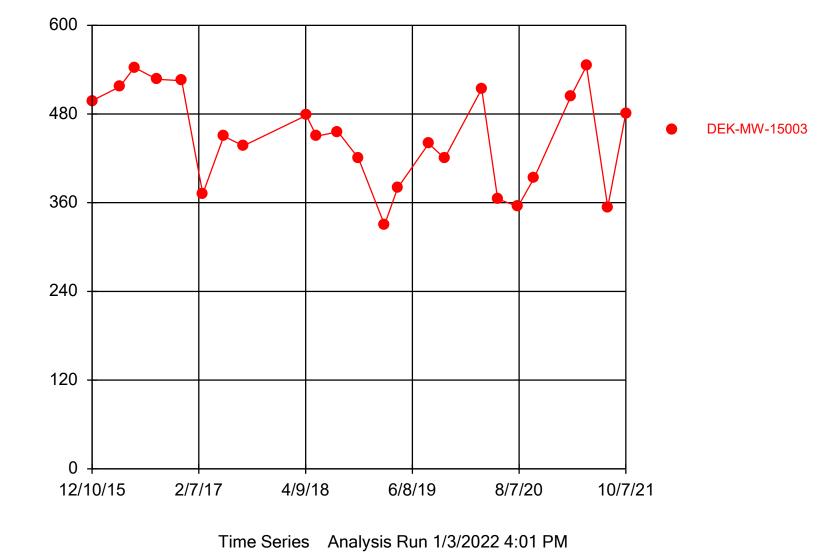
Attachment A Trend Evaluation Arsenic, Total



Time Series Analysis Run 1/3/2022 4:01 PM Client: Consumers Energy Data: DEK\_HMPCCR\_Sanitas\_21Q4

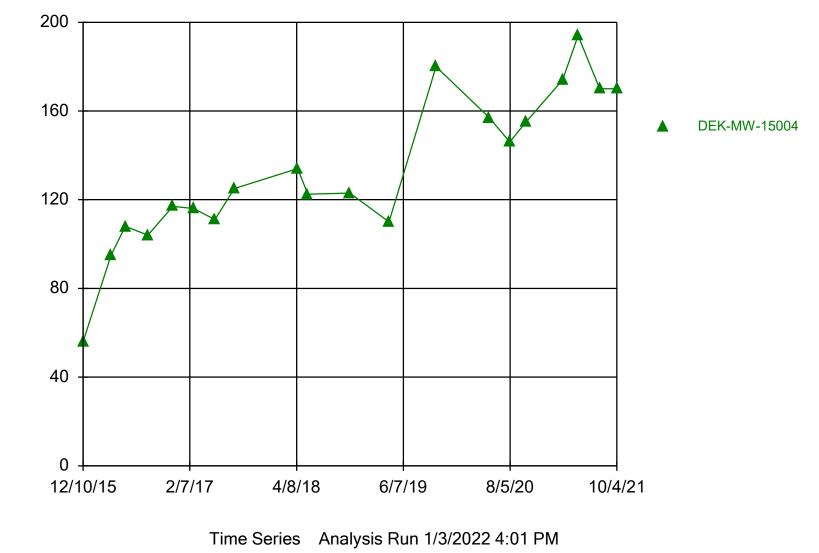
ng/L

Arsenic, Total



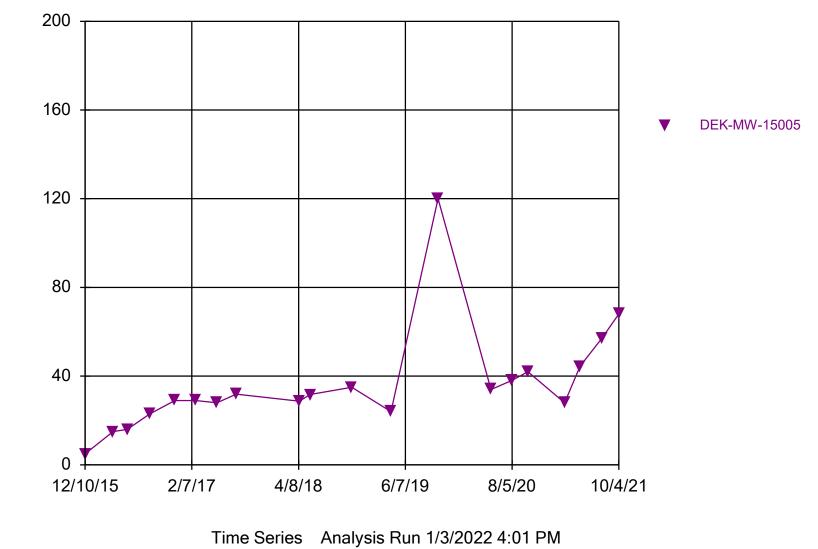
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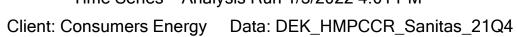
Arsenic, Total



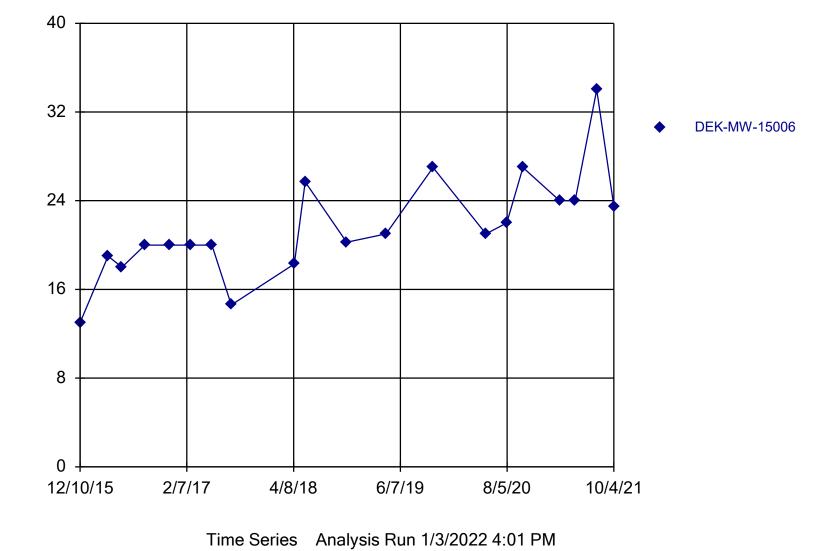
Client: Consumers Energy Data: DEK\_HMPCCR\_Sanitas\_21Q4

Arsenic, Total





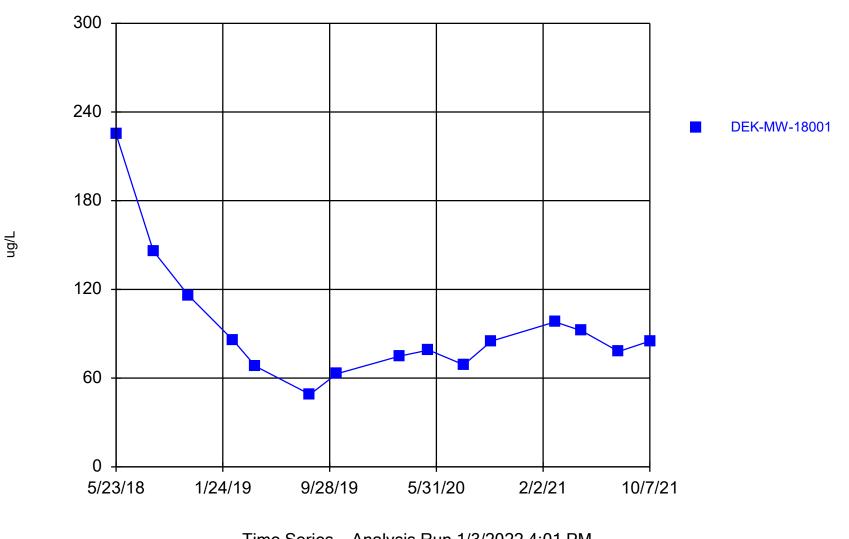
Arsenic, Total



Client: Consumers Energy Data: DEK\_HMPCCR\_Sanitas\_21Q4

ng/L

Arsenic, Total



Time Series Analysis Run 1/3/2022 4:01 PM Client: Consumers Energy Data: DEK\_HMPCCR\_Sanitas\_21Q4

